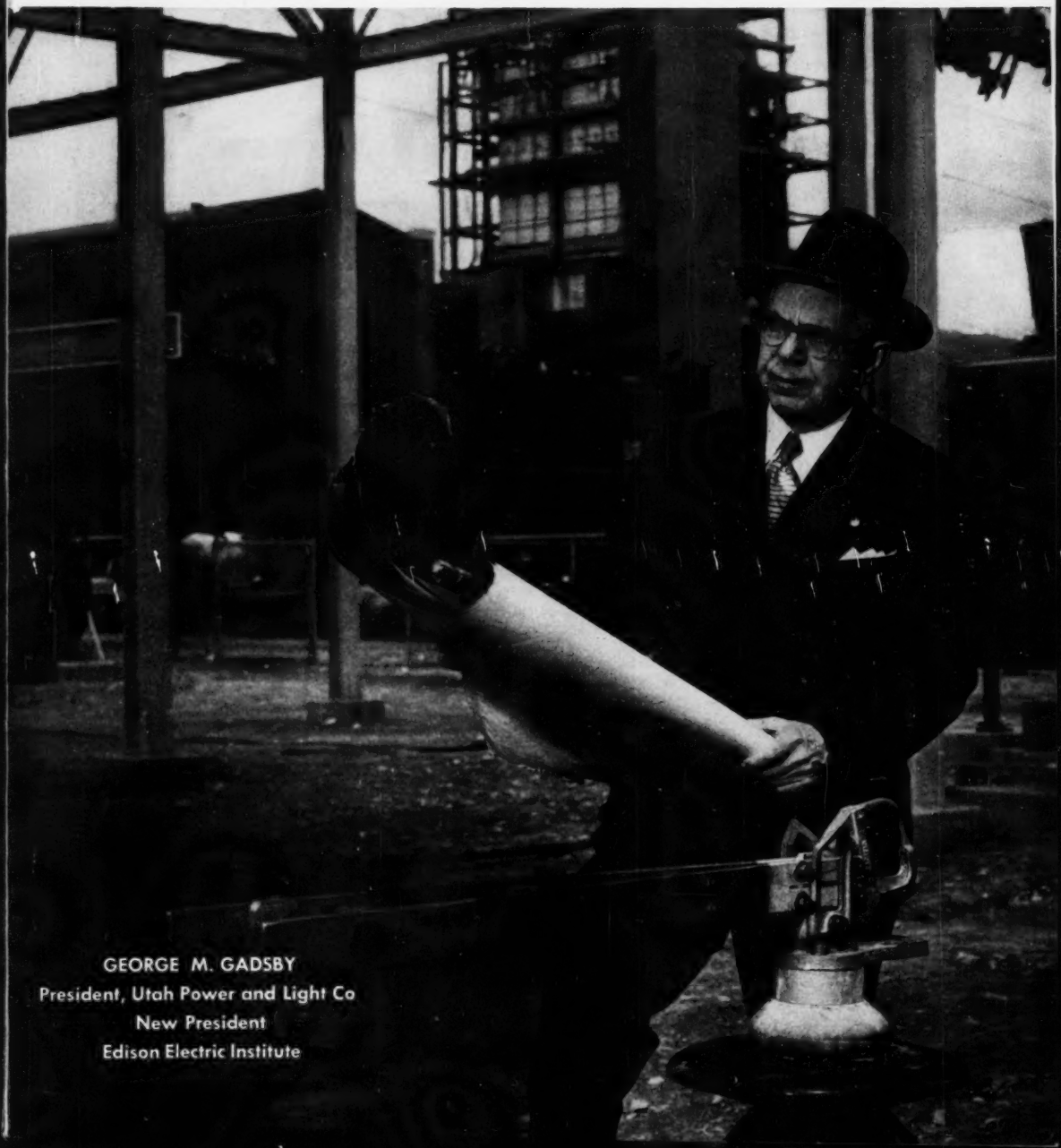
JUNE 18, 1951

Electrical World

Price 35 Cents

A McGRAW-HILL PUBLICATION



GEORGE M. GADSBY
President, Utah Power and Light Co
New President
Edison Electric Institute

OUT GO RUST, SLUDGE AND FOAM

When TEXACO REGAL OILS (R&O) go IN

To assure the full-time, full-power turbine performance that present-day production schedules demand, lubricate with *Texaco Regal Oils (R&O)*. For years before the development of rust- and oxidation-inhibiting additives, *Texaco Regal Oils* were world-famous turbine oils. Now, *with* these effective additives *plus* special foam-resistant properties, *Texaco Regal Oils (R&O)* assure better-than-ever performance.

With *Texaco Regal Oils (R&O)* in your turbines, rust, sludge and foam don't have a chance. Bearings get full protection, and governor action is sensitive and alert. *Texaco Regal Oils (R&O)* give you an extra-long oil service life . . . need less attention. Result—a greater margin of safety and lower maintenance costs.

Texaco Regal Oils (R&O) are approved by leading turbine builders and are available in every needed viscosity.

A Texaco Lubrication Engineer will gladly help you to greater efficiency and economy throughout your plant. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

TEXACO Regal Oils (R&O)

FOR ALL TURBINES

TUNE IN . . . TEXACO STAR THEATER starring MILTON BERLE on television every Tuesday night. See newspaper for time and station.

THE NEW PRESIDENT

In the minds of many Americans, Utah is most notable for the Mormons, a devoted band who withstood great hardship to settle the Salt Lake Valley in 1847. That was one year before the Utah territory became part of the U. S., which happened in 1848 when it was ceded to us after the Mexican War. 48 years later, in 1896, Utah entered the Union as a state.

It has an area of 84,916 square miles making it 10th in size among states, and its principal tourist attractions are Salt Lake City, the Great Salt Lake, and Bryce and Zion Canyons.

Salt Lake City is a lovely place, having, to all outward appearances, the widest streets, the longest blocks, and the prettiest girls in the U. S.

But the newest distinction about Utah and Salt Lake City, so far as

GEORGE M. GADSBY

Electrical World is concerned, is the fact that George Gadsby, President of Utah Power, is the newly-elected President of Edison Electric Institute.

Gadsby is a transplanted Easterner, who got a B.S. degree from M. I. T. in 1909. (He has since acquired honorary Doctor of Engineering degrees from Pittsburgh U., and Marietta College.) He has been President of Utah Power since 1929 and before that was President of West Penn Power.

He's a tireless worker in intra-industry circles—has been a leading figure in the advertising and public information programs of the Electric companies. Among other association activities, he's a director of the National Association of Manufacturers and the National Association of Electric Companies, and always seems available for community duties.

Altogether, Gadsby personifies the old saying: If you want a job well done, give it to a busy man.

THE EDITORS

Electrical World

Published for 77 years for those engaged in the business of generating, transmitting, distributing or applying electric power

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Published weekly by McGraw-Hill Publishing Company, Inc., James H. McGraw (1860-1948), Founder. Publication Office, 99-129 North Broadway, Albany 1, N. Y. Executive, Editorial and Advertising Office: McGraw-Hill Building, 330 W. 42nd St., New York 18, N. Y. Curtis W. McGraw, President; Willard Chevalier, Executive Vice-President; Joseph A. Gerardi, Vice-President and Treasurer; John J. Cooke, Secretary; Paul Montgomery, Senior Vice-President, Publications Division; Ralph B. Smith, Editorial Director; Nelson Bond, Vice-President and Director of Advertising; J. E. Blackburn, Jr., Vice-President and Director of Circulation.

Subscriptions; Address correspondence to Electrical World—Subscription Service, 99-129 N. Broadway, Albany 1, N. Y., or 330 W. 42nd St., New York 18, N. Y. Allow ten days for change of address.

Please indicate position and company connection on all subscription orders.

Single copies 35¢. For the United States and possessions $6 a year, $9 for two years. Canada, $7 for one year, $11 for two years, $14 for three years. (Canadian money, at par.) Pan-American countries, $15 for one year, $25 for two years, $30 for three years. All other countries $20 for one year, $30 for two years, $40 for three years. Entered as second class matter, November 16, 1936, at the Post Office at Albany, N. Y., under the Act of March 3, 1879. Printed in USA.

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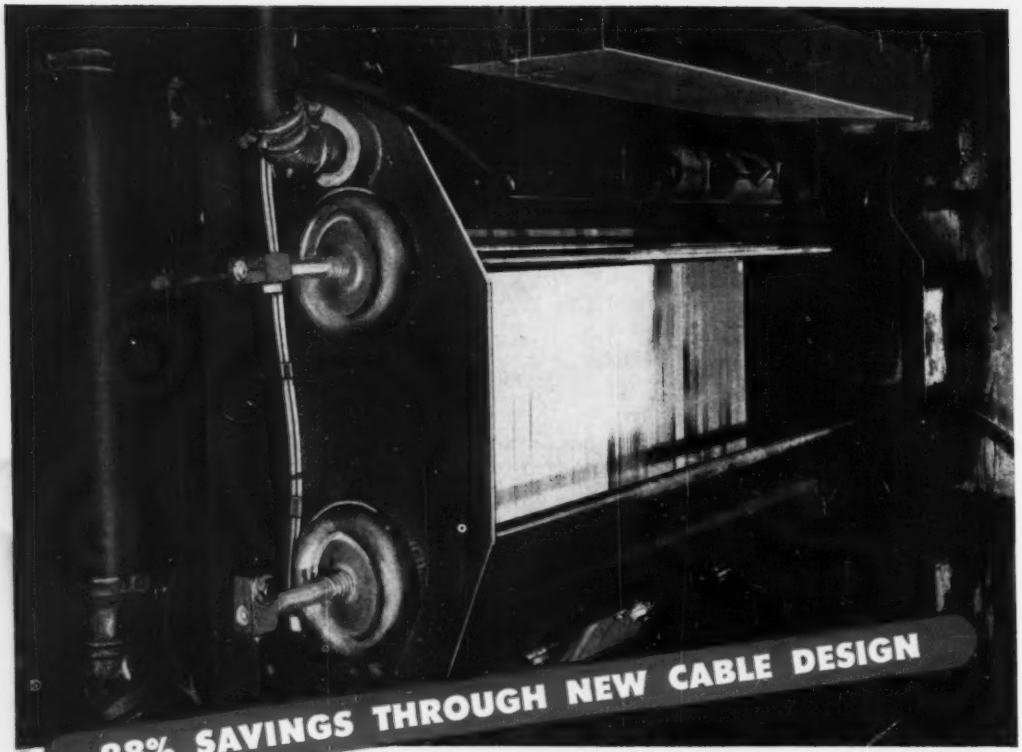


How Okonite-engineered cables save money for the McCall Corporation

Engineers of the McCall Corporation, Dayton, Ohio, sought a means of reducing their insulated cable replacements on six printing presses. The ordinary cables used for supplying the gas ignition apparatus failed quickly because of temperatures ranging from 350 to 450°F. Monthly replacements of the standard rubber-insulated automotive ignition cable previously used gave rise to the following costs:

BEFORE

Cost of cable per year	**$650.00**
Labor in replacement	**900.00**
Yearly cost: materials and labor	**$1550.00**

In 1948, at the suggestion of an Okonite engineer, McCall installed Okonite's heat-resistant Okotherm cable. Since then, no replacements have been made under conditions of normal usage. Although the Okotherm cable was several times as expensive, experience has already shown that annual costs have been reduced to a mere fraction of the previous cost, as follows:

NOW

Cost of cable per year	**$142.00**
Labor on installation	**37.50**
Total yearly cost using Okotherm	**$179.50**

...a saving of 88.5%

• • •

Stories like this are not unusual in the file of actual case histories at Okonite. For the broad research and design and manufacturing skills which have developed such long-lived, trouble-free cables for normal use, have also developed many types for highly specialized applications.

These facilities are available to *you*, to help solve any difficult cable problems arising in *your* operation. Don't hesitate to call in your nearest Okonite representative, or write The Okonite Company, Passaic, N. J.

OKONITE SINCE 1878

THE BEST CABLE IS YOUR BEST POLICY

insulated wires and cables

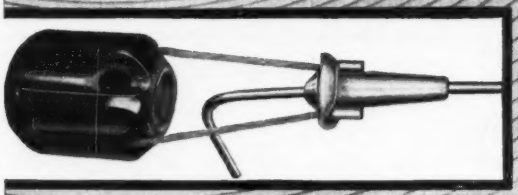
9188

Electroline

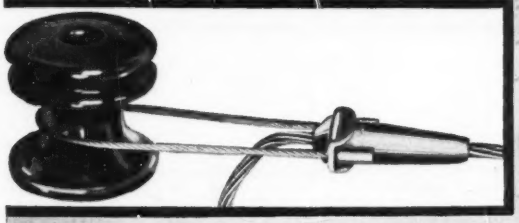
AUTOMATIC DEAD-ENDS

"AS GOOD AS NEW" AFTER TORTURE TEST

Electroline AUTOMATIC DEAD-ENDS are continually subjected to gruelling tests for strength, gripping and vibration damping features. In a typical test, 100,125,000 recorded vibrations did not develop any sign of failure of conductor in these dependable Dead-Ends. Month after month, day and night, these Dead-Ends held their positive grip and retained the full strength of the conductors. Engineers compute that the Dead-Ends withstood the equivalent of 50 years of ordinary service and state that they were as good as new at the end of the test.



3400-SERIES



The 3400-SERIES consists of an Electroline Automatic Connector, a yoke and flexible bail. These three are permanently interlocked once the conductor is inserted to form a complete unit that fits either strain or spool-type insulators.

This series permits the feeding of the conductor through the connector, eliminating the use of taps in the line span. The damping features incorporated in Electroline Dead-Ends prolong the life of conductors by preventing crystallization at the point of connection. They insure full line strength and save on construction costs by their quick and easy installation. These economical Dead-Ends can be reclaimed and used again. But, once installed, the conductor is there to stay; it cannot become detached until released by a lineman.

FOR COMPLETE DETAILS WRITE FOR BULLETIN.

TALENT TO ORIGINATE E ABILITY TO PRODUCE

Electroline Company

4121 South La Salle Street • Chicago 9, Illinois

In Canada: POWERLITE DEVICES, LTD., TORONTO

NEW LOW COST

BREAKS ANY CHARGING CURRENT AND

THE TIME-TESTED ALDUTI INTERRUPTER SWITCH AT CONVENTIONAL AIR BREAK SWITCH PRICES

Since 1939 the reliability of the solid-material confined-arc extinction method of high voltage circuit interruption illustrated below has been proved under actual service conditions in thousands of installations for switching full rated load currents, line- and cable-charging currents, and magnetizing currents.

This circuit interrupting principle is now available in group-operated arrangements for pole-top switching at prices that compare with horn gap switches.

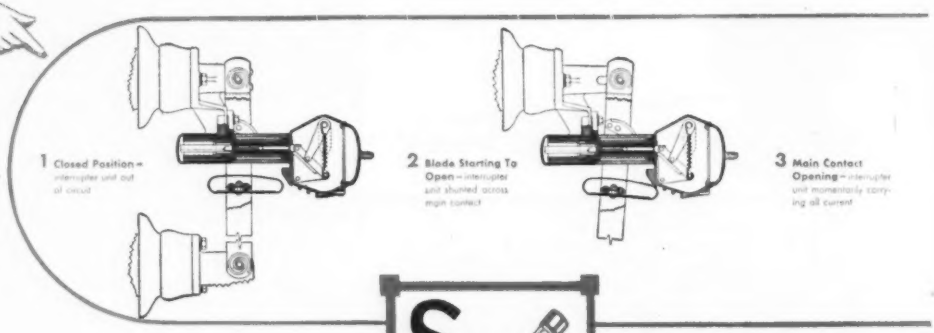
Because there is no external arc, this interrupter switch can be inverted, or mounted vertically, for simple installation and maintenance.

Further, because there is no external arc, the cost-saving side-opening design pictured here actually requires less phase spacing than a horn gap switch.

• • •

Full details are available from your local S&C representative, or the factory.

HERE'S HOW THE ALDUTI INTERRUPTER UNIT OPERATES TO PROVIDE CONFINED-ARC SWITCHING


1 Closed Position – interrupter unit out of circuit
2 Blade Starting To Open – interrupter unit shunted across main contact
3 Main Contact Opening – interrupter unit momentarily carrying all current

S&C ELECTRIC

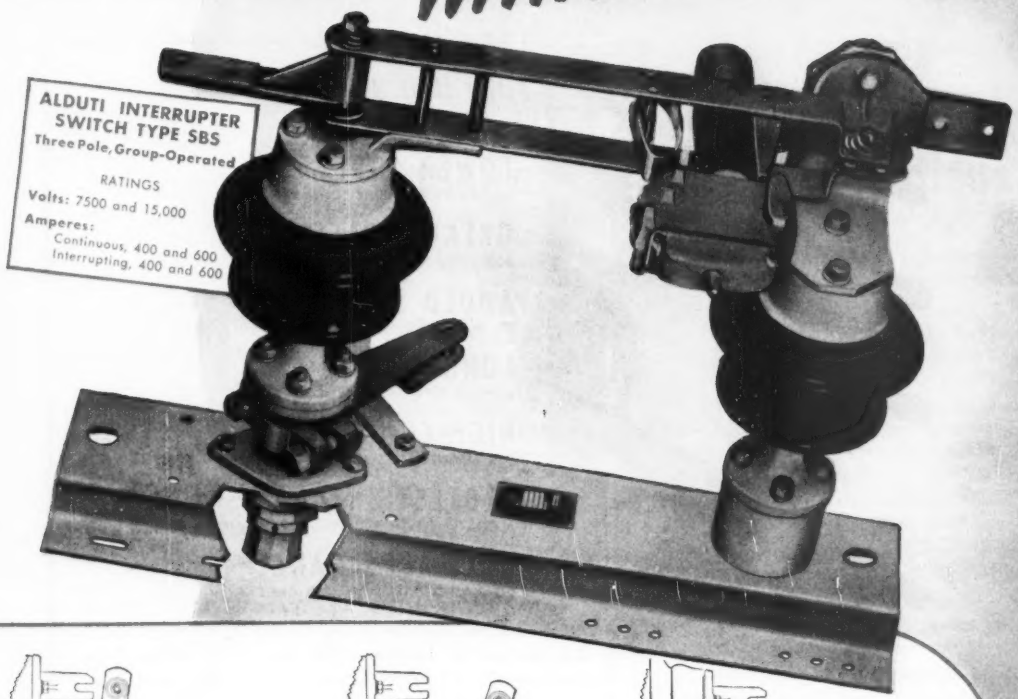
Formerly SCHWEITZER & CONRAD, INC.

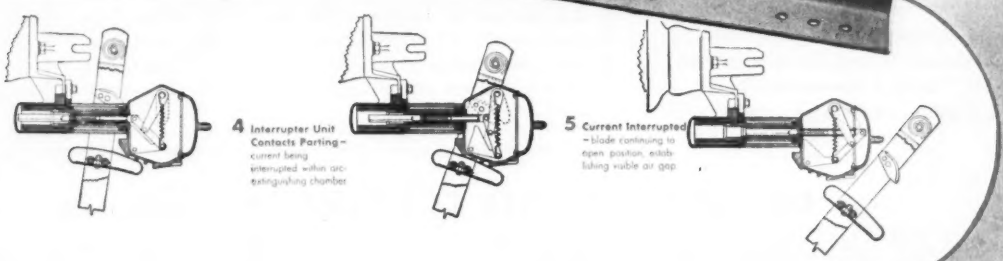
POLE TOP SWITCH

FULL LOAD CURRENT *WITHOUT ARCING!*

ALDUTI INTERRUPTER SWITCH TYPE SBS
Three Pole, Group-Operated

RATINGS
Volts: 7500 and 15,000
Amperes:
Continuous, 400 and 600
Interrupting, 400 and 600





4 **Interrupter Unit Contacts Parting** – current being interrupted within arc-extinguishing chamber

5 **Current Interrupted** – blade continuing to open position, establishing visible air gap

COMPANY

4421 Ravenswood Avenue
Chicago 40, Illinois, U. S. A.

In Canada, Electric Transmission Powerlite Devices, Limited, Toronto

SPECIFY

Copperweld TRADE MARK

NEUTRAL-MESSENGERS

for your self-supporting cables

SELF-SUPPORTING AERIAL POWER CABLES WITH COPPERWELD NEUTRAL-MESSENGERS

SELF-SUPPORTING SERVICE DROP CABLE WITH TYPE BC COPPERWELD-COPPER NEUTRAL-MESSENGER

COPPERWELD NEUTRAL MESSENGERS ARE MADE IN SIZES AND TYPES TO MEET VARIOUS COMBINATIONS OF MECHANICAL STRENGTH AND CONDUCTANCE

They'll give you:

LOWER COSTS
INITIALLY AND IN THE LONG RUN

GREATER SAFETY
FOR LONG SPANS WITHOUT EXCESSIVE SAGS

ADDED STRENGTH
TO WITHSTAND HEAVY ICE AND WIND LOADS

LONGER LIFE
BECAUSE THEIR STRENGTH IS PERMANENT

HIGH CONDUCTIVITY
FOR RETURN CURRENT IN NEUTRAL

PROTECTION AGAINST RUST
A COMPLETELY NON-RUSTING COMBINATION

NEAT APPEARANCE
COMPACT, SNUGLY STRANDED CABLE

When ordering Self-Supporting Cables from your regular suppliers, get all these important advantages by specifying Copperweld* for the Neutral-Messenger. Experienced Engineers are following this practice. They know that Copperweld combines the high strength of steel with the permanence and conductivity of copper.

*Trade Mark

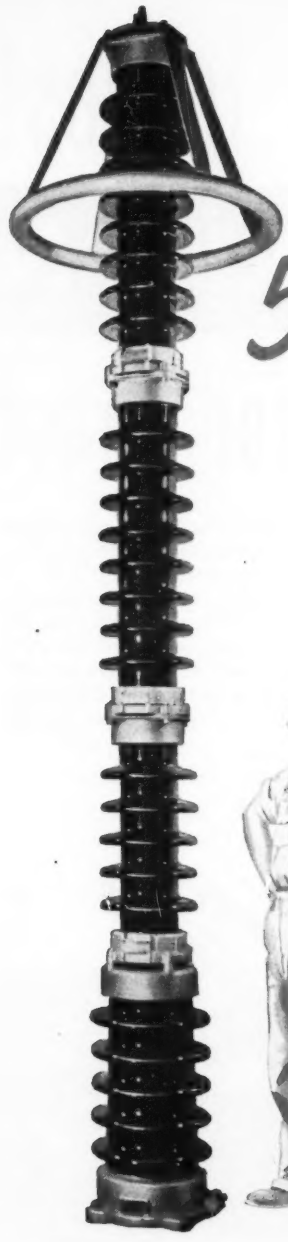
COPPERWELD STEEL COMPANY Glassport, Pa.

SALES OFFICES IN PRINCIPAL CITIES

Copperweld TRADE MARK NON-RUSTING

NEUTRAL-MESSENGERS

FOR SELF-SUPPORTING CABLES



5 Reasons Why

this arrester gives you better service under any operating conditions

For lightning protection of power equipment, you want *proved* performance. This is the way we make *sure* about the performance of SV Station Type Arresters.

1. *It's "hot" lightning tested.* Every Autovalve block gets two 10,000-ampere surges superimposed on rated 60-cycle voltage to eliminate mechanical defects.
2. *It's "durability" tested.* A five percent sample from each batch of blocks receives at least fifty 10,000-ampere long-tail discharges superimposed on rated 60-cycle voltage as a minimum quality requirement.
3. *It's "volt-ampere" tested* . . . to assure that surge characteristics of every Autovalve block meet standard tolerances.
4. *It's "moisture" tested.* Complete arrester is tested with dry nitrogen at 30 pounds pressure to assure tightness of seals.
5. *It's "sparkover" tested* . . . to be sure arrester has been properly assembled, and will withstand its power voltage rating with considerable margin.

These careful checks eliminate possible imperfections in materials or manufacture that can cause faulty operation or failure in service. For complete information on SV Arresters write for D. B. 38-120. Address: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-60755

YOU CAN BE SURE.. IF IT'S

Westinghouse

SV ARRESTERS

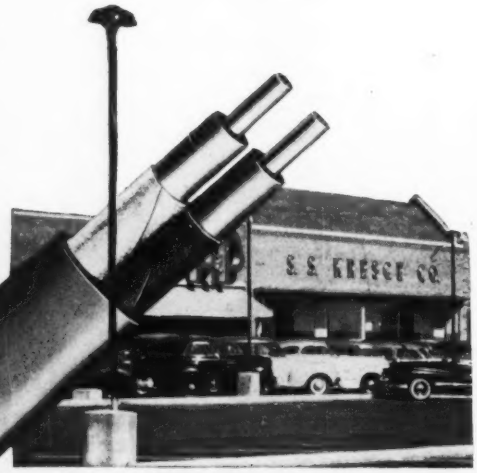
Low in cost

AMERICAN

for direct

● American Parkway Cable can save a lot of money *safely* compared to conduit or duct installations and lead-covered cable.

Look at the safety story in our Amarine-Amerprene construction: Amarine insulation meets all heat-resisting requirements of ASTM D754. It's approved by Underwriter's for moist locations without a lead sheath (Type RW). You can run at 75°C. to get high current ratings



AMERICAN STEEL & WIRE COMPANY
USS
AMERICAN ELECTRICAL WIRE AND CABLE
UNITED STATES STEEL

EASY TO BURY—just plow a trench, lay the cable and fill.

SAVES MONEY—no conduit, no high-maintenance aerial systems.

*PS Shielding—an original development of American Steel & Wire Company.

—easy to handle

PARKWAY CABLE

earth burial

—yet moisture won't ruin the insulation.

The Amerprene jacket meets all requirements of ASTM D752. Amerprene resists flame and will not propagate fire. It resists moisture, sunlight, mineral oil, grease — and it meets the IPCEA-ASTM ozone resistance requirements. Amerprene stands way above cotton coverings because it lasts much longer when exposed to moisture and oil. And, of course, it's cheaper and easier to handle than lead-sheathed cable.

Amarine-Amerprene cables can be laid in an ordinary plowed furrow or hand-cut trench. 12 to 18 inches is usually deep enough, because these cables are not affected by frost.

Amarine-Amerprene can be furnished with PS Shielding* and ground wires where workman safety and freedom from corona discharge are important factors.

AMERICAN STEEL & WIRE COMPANY, GENERAL OFFICES: CLEVELAND, OHIO
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SEND THIS COUPON FOR MORE INFORMATION

American Steel & Wire Company
Rockefeller Building
Cleveland 13, Ohio

Please send me complete information on Amarine-Amerprene Parkway Cable.

Name.....
Company.....
Address.....
City & State.....

USS **American Electrical Wire and Cable**

UNITED STATES STEEL

Modernized Meter Test Procedures demand *the standard of accuracy*

The growing interest in shop testing of service meters indicates that *now* is the time to re-examine your test equipment and procedures. Maximum efficiency and maximum accuracy are assured only when modern laborsaving equipment is combined with the most accurate standard. The accuracy of your service meter testing can be no better than the accuracy of your rotating standard.

Sangamo Type J Rotating Standards can be your standard of accuracy because they are:

- ACCURATE—as the result of fundamental design.
- ACCURATE—as the result of painstaking, expert calibration.
- ACCURATE—since calibration is practically unaffected by age or usage.

Build *your* modernization program around this standard of accuracy—the Sangamo Type J Rotating Standard. Specific technical information is given in Bulletin 290. Write for your copy today.

SANGAMO — *Only Measured Facts are Known Facts*

Sangamo Type J
Rotating Standards
(The Standard of Accuracy)

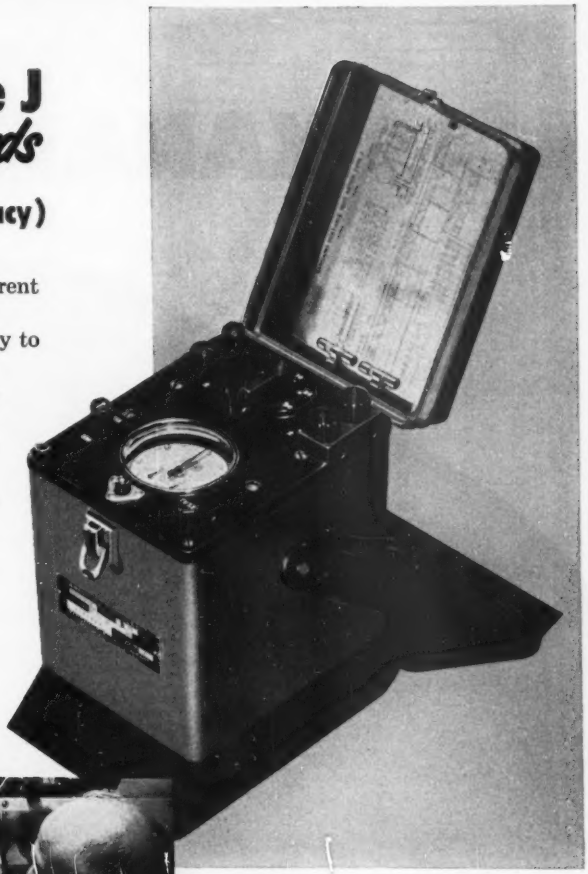
Straight line load curve on all current ranges.

Thermal current carrying capacity to 200% load.

Minimum deviation between current ranges.

Fully compensated for temperature and voltage variations.

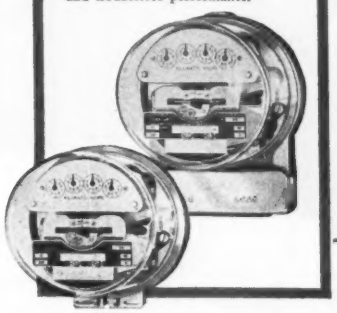
Available in 1, 3, 4 or 5 current ranges.



The above close-up shows the unique arrangement used by the Southern California Edison Company. The Sangamo Type J Rotating Standard is mounted horizontally behind a panel with a combination of mirrors to provide for maximum ease of reading. The large photograph shows their very modern Meter Testing Department.

Sangamo J Meters

These watthour meters meet today's requirements and tomorrow's anticipated loads with sustained accuracy, economy of maintenance and troublefree performance.

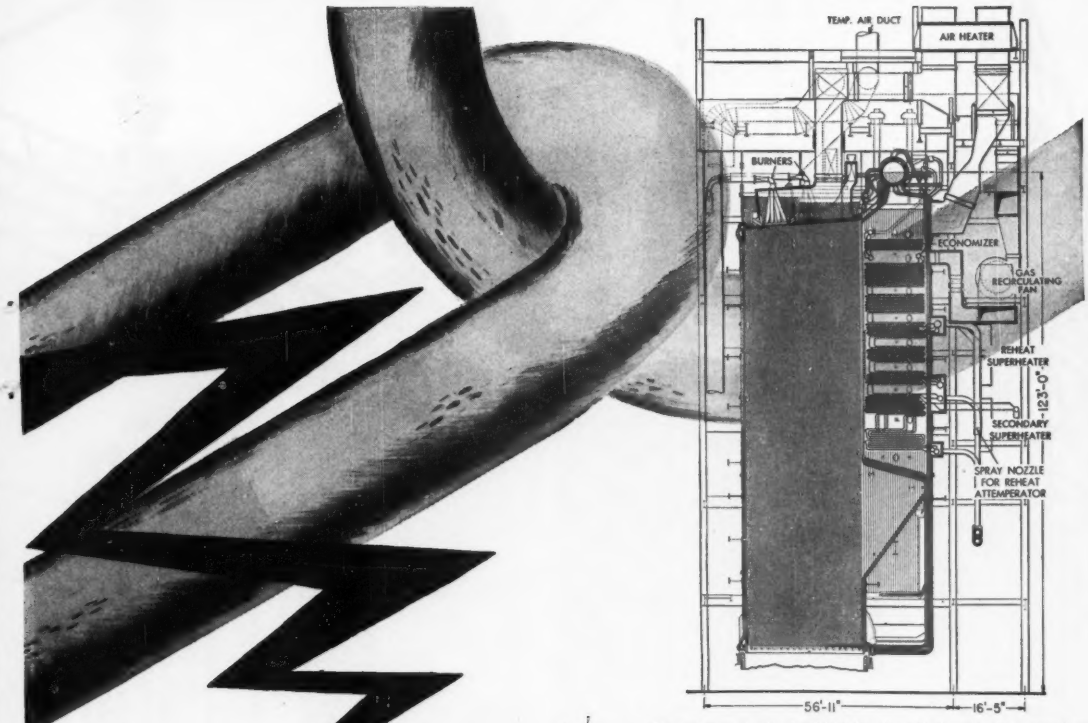


SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

KANAWHA

The Kanawha River Plant of Appalachian Electric Power Company, an American Gas and Electric System Company.



One of two duplicate B&W Radiant Boilers for the new Kanawha River Plant. Steam capacity is 1,335,000 lb. per hr. each, with boiler design pressure of 2400 psi; final steam temperature, 1050 F, with reheat to 1050 F.

Forging the Future of AMERICA'S POWER

A monument to faith in America's future power is rising in the Kanawha Valley—where the Kanawha River generating plant of Appalachian Electric Power Company will ultimately link a million new kilowatts to the massive forge of U.S. production for defense and peace.

Part of a quarter-billion dollar expansion budget, Kanawha will start up with the world's two largest single-boiler generating units—2,670,000 lb. per hr. combined total steam capacity, serving a round-the-clock gross generating capability of 434,520 kw . . . almost double the present demand of all industrial and residential customers in the area it will serve.

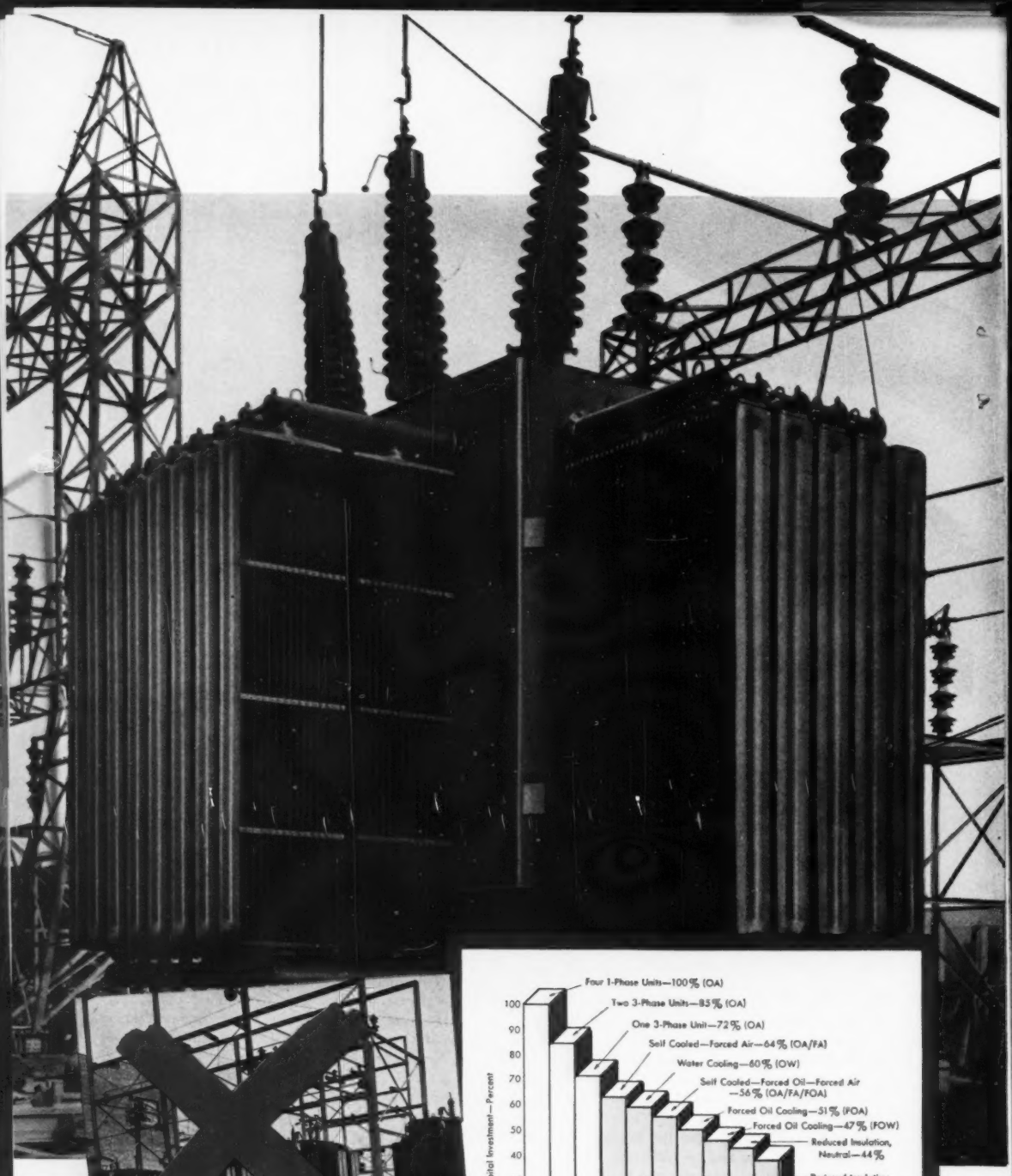
Kanawha's boilers are *big*. Their furnaces, of the divided-type, will have the highest heat-input of any boilers ever built—1,860,000,000 BTU per boiler, per hour . . . and the two boilers will burn over a million tons of coal yearly. Boiler design incorporates two of the latest B&W-pioneered features: pressurized furnaces and gas-recirculation . . . the latter combined with spray attemperation in the superheater to give steam-temperature control over a wide range of capacity.

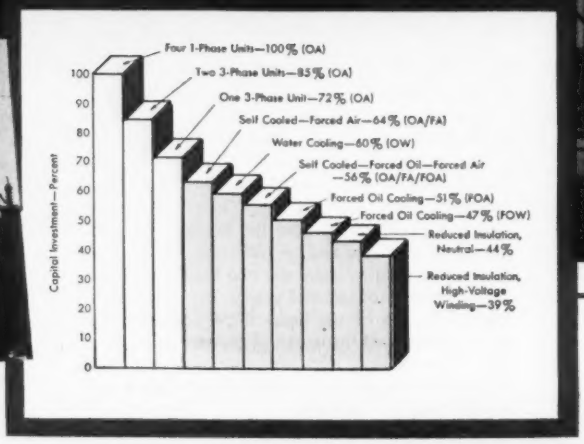
With their large reheat capacity, high temperature-pressure characteristics, and the additional efficiencies inherent in pressure-furnace operation and recirculation of flue-gases, these units will contribute much to the expected plant heat-rate of 9,035 BTU per net kw-hr. . . . probably the lowest ever attained.

Kanawha is a striking testimonial to the fact that 67 years of phenomenal improvement in power generation have not dulled the industry's keen sense of progress. Courage and far-sightedness of our power companies, and their confidence in supplier organizations, will surely continue to forge new links in the chain of technological development that has made this industry, and the millions it serves, a continuing power in America's greatness and strength.

BABCOCK & WILCOX

G-5407





Summation of possible reductions in investment for generating station transformer banks.

MODERN 3-PHASE POWER TRANSFORMERS

Cut Capital Investment 15% to 28%

Important improvements in power transformer design and applications can bring savings that add up to 50%, and more.

For example, banks of single-phase transformers are being superseded by three-phase units, used singly and in pairs. In a typical instance, two three-phase transformers cut initial cost by 15% over a four-unit single-phase bank. Since reliability has been increased to a point where outages are practically negligible, a single large three-phase unit can be used, at an additional savings of 15%, or an over-all economy of 28% . . . and there's an appreciable improvement in transformer efficiency.

These examples are based on straight self-cooled design. By various applications of new cooling and insulating techniques, capital savings can be made to reach, or even exceed, 50%.

Westinghouse Power Transformers are smaller and lighter per kva than any other transformer on the market. As a result, you can expect these additional savings:

1. **Reduced space required.**
2. **Smaller foundations.**
3. **Smaller superstructures.**
4. **Lower field-assembly expense. Transformers shipped more completely assembled.**
5. **Lower maintenance expense... Rugged all-welded construction plus smaller size.**

Your Westinghouse representative will be glad to give you complete details. Phone him today, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

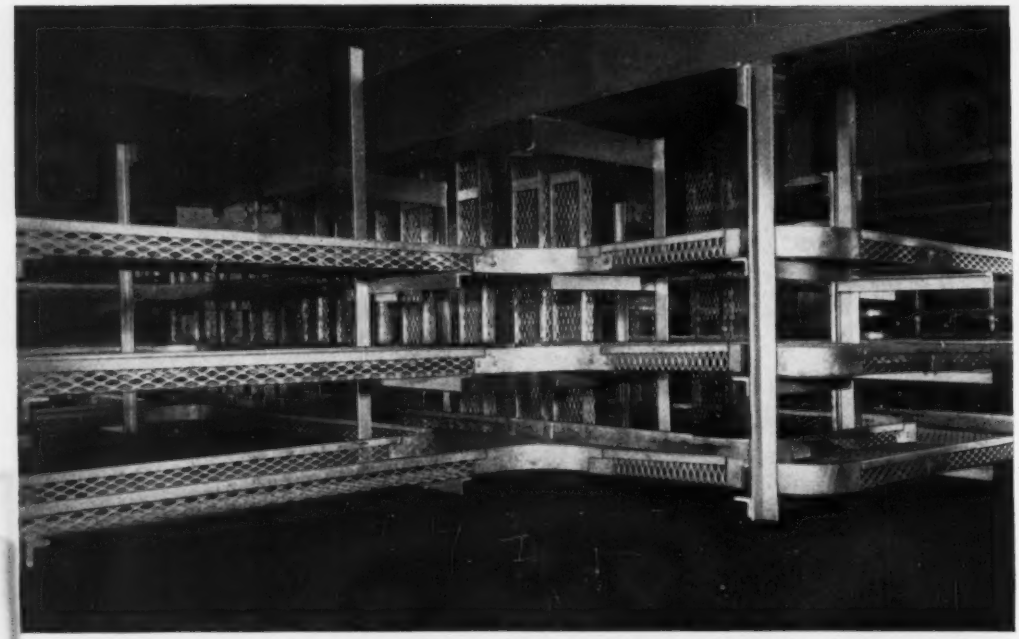
J-70580

WESTINGHOUSE POWER TRANSFORMERS ARE SMALLER AND LIGHTER PER KVA THAN ANY OTHER TRANSFORMER . . . YET THEY GIVE SUPERIOR PERFORMANCE

YOU CAN BE SURE.. IF IT'S

Westinghouse

POWER TRANSFORMERS



The NEW Cope Cable Trough Enables You To

CUTS COSTS UP TO 66%

An outstanding utility company reports that on a large job their installation of Cope Cable Trough saved them 66% of the cost of a conduit installation!

Savings are always made when Cope Cable Trough is used—real savings in material, labor and costs.

Such savings are not only necessary at all times, but doubly so during our Country's State of Emergency.

In most cases Design Engineers can order standard Cope Cable Trough and Fittings for a complete installation job, but in cases where special fittings are required they have Cope Engineers to help solve their problems. The elimination of costly engineering—the ease of installation—man-hour reduction—all of these factors reduce costs and increase savings through the use of Cope Cable Trough.

If you want to save—and you *will* save—write now for the detailed bulletin on Cope Cable Trough.

You know Cope by these Products . . .

T. J. Cope INC.

T. J. COPE, INC., 711 SOUTH 50th ST.
PHILADELPHIA 43, PENNSYLVANIA

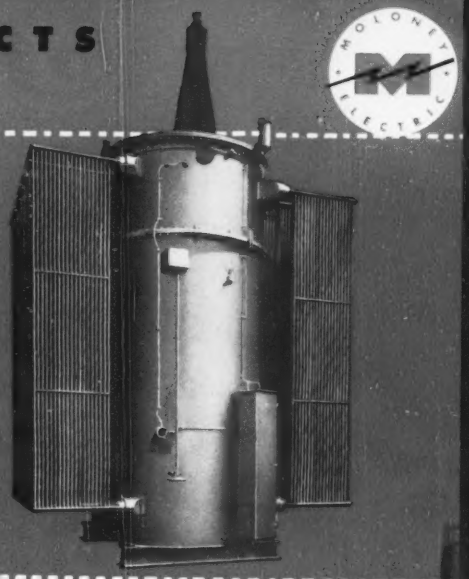
MOLONEY PRODUCTS

These pages describe and illustrate the various products of the Moloney Electric Company. For further information address your inquiry to the nearest Sales Office listed on page H-8 or write direct to Moloney Electric Company, 5391 Bircher Blvd., St. Louis 20, Mo.

POWER TRANSFORMERS

The Moloney Electric Company manufactures Power Transformers of any voltage rating or capacity desired. Standard designs offer saving on single-phase ratings up to 5000 Kva and three-phase ratings up to 10,000 Kva in voltages from 2400 to 67,000 volts. These standard designs also permit quicker deliveries as a result of savings in engineering time.

Power Transformers may be furnished with Askarel (non-inflammable cooling liquid) for use in locations where the use of oil might constitute a hazard.

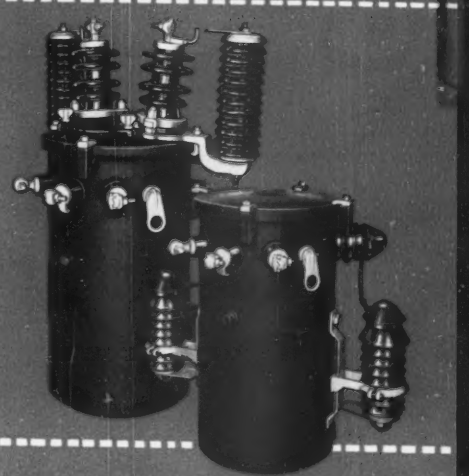


CONVENTIONAL DISTRIBUTION TRANSFORMERS

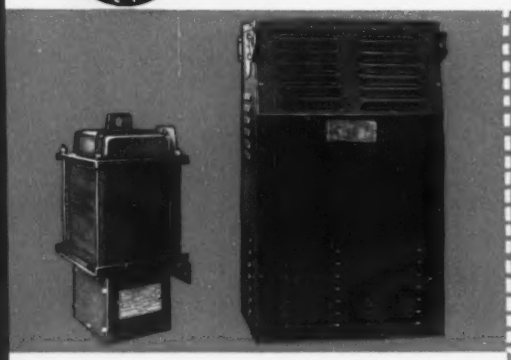
Moloney Conventional Distribution Transformers are manufactured in all standard single-phase and three-phase ratings up to 500 Kva in voltages of 67,000 volts and below. HiperCore construction on sizes up to 100 Kva, 15,000 volts and below, contributes to their smaller size, lighter weight, increased efficiency and better regulation. Illustrations show small single-phase HiperCore Transformers. Distribution transformers are provided with standard taps and accessories in all ratings in accordance with ASA and NEMA standards.

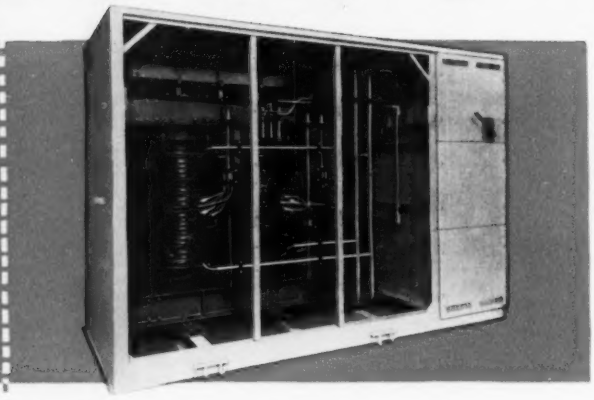
CSP DISTRIBUTION TRANSFORMERS

Moloney Completely Self-Protected (CSP) Transformers are manufactured in all standard single-phase ratings up to 100 Kva and three-phase ratings up to 150 Kva, in voltages below 15,000 volts. Equipment includes tank-mounted lightning arresters, internal primary protective links, tank grounding gap and secondary circuit breaker. Signal lights are provided on all sizes 5 Kva and larger to indicate overload conditions. The signal light remains on till the circuit breaker is reset even though the overload may be of insufficient magnitude to trip the breakers.



MOLONEY



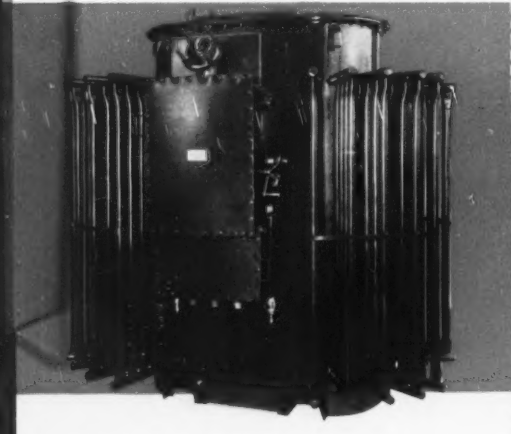


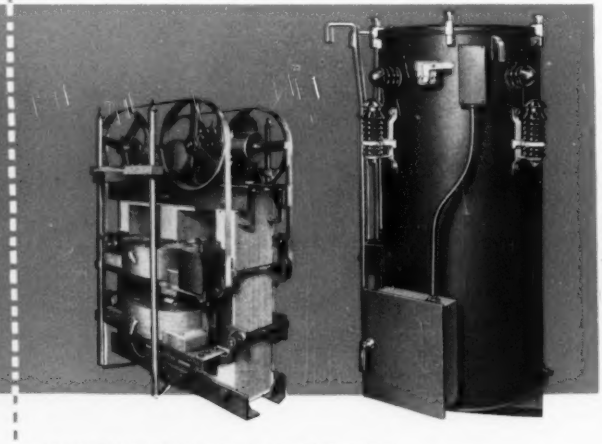
DRY TYPE, AIR-COOLED TRANSFORMERS
(600 volts and below)

Moloney Dry Type Transformers with primary voltages of 600 volts and below are manufactured in standard single-phase and three-phase ratings from 1.5 Kva to 300 Kva. 1½ to 10 Kva single-phase transformers are of Type DS weatherproof construction as illustrated at left. 15 to 150 Kva single-phase transformers are of Type DC construction as illustrated at right for indoor service only. Three-phase units are not illustrated here.

DRY-TYPE, AIR-COOLED TRANSFORMERS
(2400 volts and above)

Moloney Dry-Type Transformers with primary voltages of 2400 volts or higher are made with Class B insulation (80° C. rise). Because of the absence of a cooling liquid, there is practically no maintenance cost when using air-cooled transformers. There is no liquid to require testing and conditioning and no valves, gaskets, or cooling tubes to maintain. Dry-Type Transformers are limited to a maximum voltage of 15,000 volts and to a maximum size of approximately 3750 Kva.





ASKAREL TRANSFORMERS
(Non-Inflammable—Liquid-Cooled)

Askarel Transformers contain a non-inflammable cooling and insulating liquid. This permits installation indoors without the expense of a fireproof vault. Their weatherproof construction also permits outdoor installation such as on roofs of buildings, in sidewalk vaults, in mines, and in other locations where the presence of oil-filled transformers might constitute a hazard. Askarel Transformers are available in the same ratings as oil-cooled transformers.

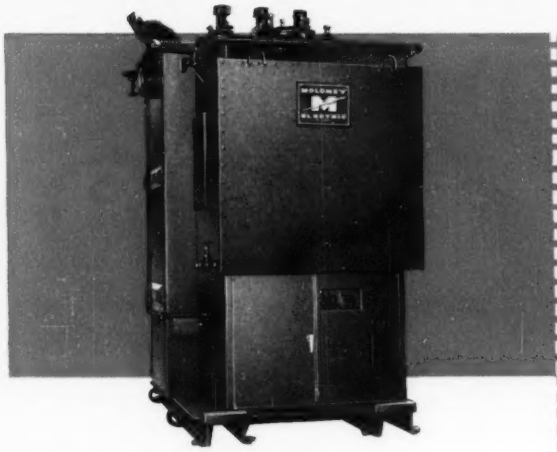
CONSTANT CURRENT TRANSFORMERS
(including Packaged Units)

Moloney Constant Current Transformers are designed for use on series street or highway lighting circuits. They are available in Pole, Subway and Station Types.

Packaged Unit Constant Current Transformers are oil-cooled units for pole or platform mounting, which are equipped with complete, built-in, protective and control equipment.

All constant current transformers may be supplied with built-in capacitors for power factor correction.

MOLONEY

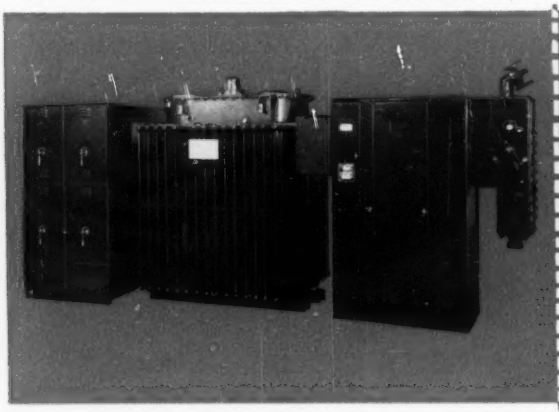


FEEDER VOLTAGE REGULATORS AND REGULATING TRANSFORMERS

Moloney Feeder Voltage Regulators and Regulating Transformers provide excellent voltage regulation through use of the Moloney Load Tap Changer. 10% plus and minus voltage regulation is provided in either 32-⅝% or 16-1¼% steps. Operation of the Load Tap Changer equipment on Feeder Voltage Regulators is completely automatic. Regulating Transformers can be arranged for either automatic control or remote-manual control, or a combination of the two.

LOAD RATIO CONTROL TRANSFORMERS

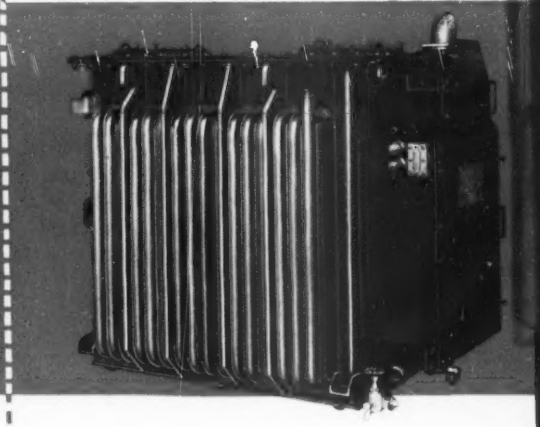
Power Transformers of all sizes are available with Load Ratio Control Equipment to maintain uniform voltage at the load by changing the voltage ratio without interruption of service. The Load Ratio Control mechanism is enclosed in an oil-filled compartment separate from the main transformer tank. The associated control equipment is housed in a dust-proof housing separate from both the main tank and the LRC mechanism compartment. Controls may be either automatic, remote-manual, or both.



LOAD CENTER UNIT SUBSTATIONS

Load Center Unit Substations are available for either indoor or outdoor installation. Indoor types available with either air-cooled or Askarel-cooled transformers. Outdoor types available with either oil-cooled or Askarel-cooled transformers. Substations can be supplied with various arrangements of switches, fuses and low voltage switchgear.

Liquid-cooled units can be provided with Automatic Load Ratio Control equipment to maintain a uniform voltage under varying load conditions.

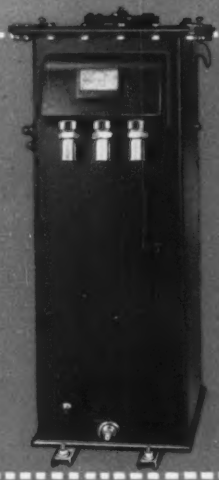


NETWORK TRANSFORMERS

Network Transformers are available in Submersible and Vault Types and with either oil or Askarel as the insulating and cooling liquid. These are compactly built transformers which take up a minimum of space in underground vaults.

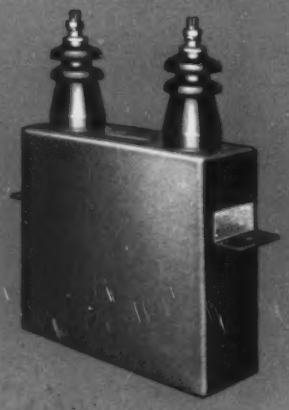
Standard three-pole, three-position disconnecting and grounding switches permit isolating the transformer from the primary circuit. The low voltage end of the transformer is provided with a throat for attaching a network protector.

MOLONEY



SUBMERSIBLE DISTRIBUTION TRANSFORMERS

Submersible Distribution Transformers are designed for underground service. Their construction permits operation while submerged for long periods of time. Wiping sleeves are provided for connection of lead-covered cables. A watertight gasketed joint is maintained between the cover and tank. Tanks, and cooling tubes which are provided on the larger sizes, are of a heavy gauge metal to withstand the rigors of underground service.



CAPACITORS

Moloney Shunt Capacitors correct low power factor conditions by reducing reactive Kva. Improved power factor results in more efficient use of generator, transformer and feeder line capacity, and improves voltage regulation.

Individual capacitor sections are wound of aluminum foil and pure kraft insulating paper. Complete capacitors are vacuum-filled with Askarel, a non-inflammable insulating liquid. Solder seal bushings are provided on all Moloney Capacitors to prevent entrance of air or moisture.

Standard capacitor ratings are 15 and 25 Kvar in voltages from 2400 to 13,800 volts.

Sales Offices

Alexandria, Va.
401 Doniphan Bldg.

Allentown, Pa.
831 Linden St.

Amarillo, Tex.
616 Amarillo Bldg.

Anderson, S. C.
460 Tribble St.

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354 Midland Bank Bldg.

Montreal 2, Que.
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of Canada, Ltd.
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New Orleans 15, La.
4018 Thalia St.

New York 5, N. Y.
[illegible] Liberty St.

Omaha 2, Nebr.
1104-5 WOW Bldg.

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1224 Commercial
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2155 First Ave., South

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407 Holbrook Bldg.
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Seattle 1, Wash.
2603 Western Ave.

Shreveport, La.
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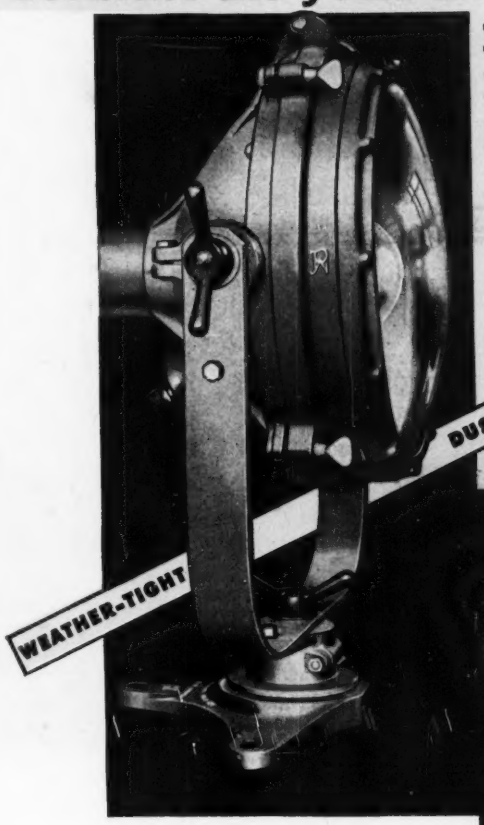
Silver Springs, Md.
1410 Dale Drive

Syracuse, N. Y.
514 City Bank Bldg.

Toronto, Ont.
Moloney Elec. Co.
of Canada, Ltd.
213-219 Sterling Rd.

Wheeling, W. Va.
22nd & Market Sts.

Consider the years ahead!



For PROTECTIVE and PRODUCTIVE lighting

Specify

PYLE-NATIONAL

ENCLOSED FLOODLIGHTS

Oil Refinery, Oklahoma, 1925

Don't economize on the initial cost when planning a floodlight installation. It is the elimination of large maintenance, repair and replacement expense that counts.

Sealed against moisture and dirt, constructed throughout of rugged, corrosion-proof materials, Pyle-National floodlights retain their original high-efficiency output throughout an exceptionally long service life, with negligible maintenance and replacement expense.

The earliest Pyle-National floodlighting installations are still operating in excellent condition, with *over a quarter of a century* of efficient, economical service to their credit! Convincing proof of the value of quality, enclosed floodlights.

Write for catalog 2100 which gives a complete description of our extensive line of heavy duty floodlights.

The services of our experienced floodlighting specialists are available at all times to advise and assist in installation problems.

THE PYLE-NATIONAL COMPANY

1385 NORTH KOSTNER AVENUE, CHICAGO 51, ILLINOIS

District Offices and Representatives in Principal Cities of the United States

Export Department: International Railways Supply Co., 30 Church St., New York.

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SINCE 1897

CONDUIT FITTINGS • PLUGS AND RECEPTACLES • TURBO-GENERATORS • GYRALITES • MULTI-VENT AIR DISTRIBUTION

More use from used poles

Many reclaimed utility poles and crossarms are good for many additional years of service when Monsanto Penta (pentachlorophenol) is applied by the simple dip method, such as shown in the illustration. Penta treatment is *easy, economical, efficient.*

Dirt and old preservative residues are removed from the surfaces before the poles are dipped. Then poles are lowered into a vat and left overnight or longer. The vat, which is 14 feet deep, also is used to treat crossarms and lumber.

Properly formulated penta is a *clean* treatment. It protects poles and crossarms from decay due to fungi and from attack by termites and other wood-boring insects. Penta, a chemical with stability, gives uniform, long-lasting protection. It is insoluble in water and does not leach. Penta treatment does not change dimensions of wood nor corrode common metals.

For detailed information on applying Monsanto Penta to poles, crossarms or other wooden structures, contact the nearest Monsanto Sales Office or write MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, 1700 South Second Street, St. Louis 4, Missouri.

KEEP YOUR TREATING PLANT BUSY!

There are so many places in which you can lower maintenance costs by using penta-treated wood, that it often is practical to keep treating facilities working around the clock. Here are a few of the numerous applications:

Poles and crossarms • Planks covering underground cables • Transformer platforms • Sills and plates • Joists and girders • Screeds and subflooring • Flooring • Roof planks • Platforms and decking • Posts and fences • Cooling towers • Millwork • Guardrails • Truck beds • Construction timbers.

DISTRICT SALES OFFICES: Birmingham, Boston, Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Seattle. In Canada, Monsanto (Canada) Ltd., Montreal.

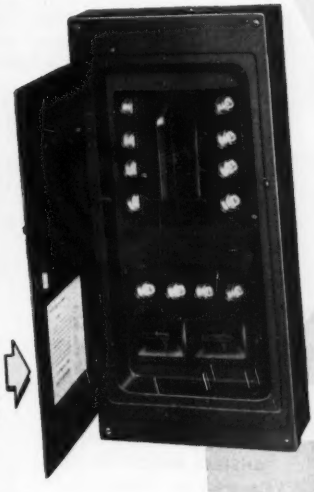
MONSANTO
CHEMICALS — PLASTICS

SERVING INDUSTRY...WHICH SERVES MANKIND

new

100 Ampere Fusible SERVICE ENTRANCE EQUIPMENT

PARALLEL MAINS
Available with three, 3 wire, 30 or 60 ampere pullouts with 4, 6 and 8 plug fuse branches



SERIES MAINS
100 ampere pullout controls two, 3 wire, 30 or 60 ampere pullouts with 8, 10, or 12 plug fuse branches

Adds to Square D's extensive line of fusible service entrance equipment— designed to meet the increasing demands of modern "electrical living"

The Complete Line covers 1 to 12 circuits for Lighting, Electric Ranges, Water Heaters and Special Appliances. All Underwriters' Approved.

ALL HAVE THESE
DESIGN LEADERSHIP
FEATURES:

Generous Wiring Space. Simple to install and maintain.
Solderless Connectors on all terminals. Easier, faster wiring.
Dead-Front Construction. No live parts are exposed.
Ample Knockouts. Designed and located for convenient wire pulling and "ganging."
Raintight Enclosures available with Square D's new Interchangeable Hubs.

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

SQUARE D COMPANY

DETROIT · MILWAUKEE · LOS ANGELES

SQUARE D COMPANY CANADA LTD., TORONTO • SQUARE D de MEXICO, S.A., MEXICO CITY, D.F.

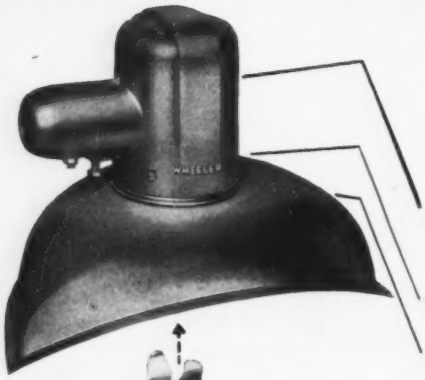
Wheeler

ADVANTAGES AND ADVANCES IN MULTIPLE STREET LIGHTING

New!

- *A UNIDIRECTIONAL LUMINAIRE*
- for DEAD-END STREETS
- for T-INTERSECTIONS
- for *STREET* BENDS —

IN ADDITION TO STANDARD IES TYPES I AND II



WHEELER Cat. No. 3900 LOW VOLTAGE HEAD with Bayonet MULTIPLE Receptacle on NO-SLIP Adjustable Socket Support.

WHEELER Screw Ring Reflector attachment permits optional filament shielding.

WHEELER Cat. No. 5321 CRESCENT REFLECTOR with normally visible filament position and stainless steel Edgeflectors. The FIRST satisfactory Type II "Helmet" Reflector.

WHEELER Cat. No. 2717 MEDIUM BASE SOCKET — BAYONET TYPE TO TAKE YOUR SERIES LAMP PULLER

View showing Edgeflector.

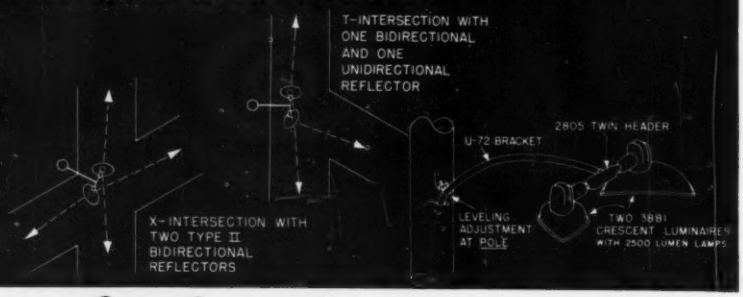
FOR COMPLETE INFORMATION
write to:
STREET LIGHTING DEPT.
WHEELER REFLECTOR CO.
275 Congress St. Boston 10, Mass.

ANNOUNCING

The FIRST system ever devised for efficient residential street lighting. Twin Type II units, either bidirectional or unidirectional, for high utilization factors in all kinds of street configurations — using Wheeler Cat. No. 2805 Twin Bracket Header.

SEE DIAGRAMS AT RIGHT →

- ★ Intersection Lighting with Standard Type II Luminaires
- ★ No dark intersection if one lamp burns out
- ★ Profitable Business — Revenue from two lamps on one bracket
- ★ House shielding at Intersections
- ★ Low Cost equipment for 5000 Lumen installations


T-INTERSECTION WITH ONE BIDIRECTIONAL AND ONE UNIDIRECTIONAL REFLECTOR
2805 TWIN HEADER
U-72 BRACKET
X-INTERSECTION WITH TWO TYPE II BIDIRECTIONAL REFLECTORS
LEVELING ADJUSTMENT AT POLE
TWO 3881 CRESCENT LUMINAIRES WITH 2500 LUMEN LAMPS

STREET Wheeler LIGHTING

SPECIALISTS IN SKILLED LIGHTING EQUIPMENT SINCE 1881

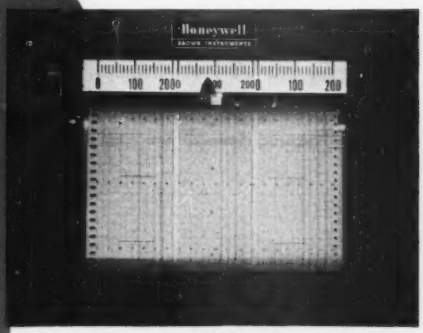
CHECK THE FEATURES OF ELECTRONIK POTENTIOMETERS THAT MEAN MOST TO YOU . . .

- SIMPLICITY
- ACCURACY
- DEPENDABILITY
- RUGGEDNESS
- FLEXIBILITY

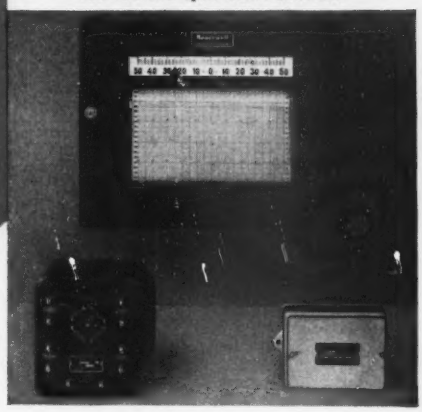
UTILIZE THE FLEXIBILITY OF *ElectroniK* POTENTIOMETERS

Check these FLEXIBILITY features:

- √ *Variety of bridge circuits . . . Wheatstone, Kelvin, impedance, resistance thermometer, thermocouple, etc.*
- √ *Variety of auxiliary switches for audible or visual alarms.*
- √ *Variety of chart speeds—½" to 120" per hour.*
- √ *Variety of printing speeds—1 to 30 seconds.*



ElectroniK Split-Chart Recorder



ElectroniK Megavar Meter Recorder

THE flexibility of *ElectroniK* Potentiometers makes them ideal for the varied demands of central stations. The features of standardization and interchangeability of components simplify maintenance and stocking of parts.

Applicable to the measurement of temperature, pressure, flow, power, current, voltage, frequency, speed, pH and conductivity . . . such flexibility in measuring variables is easily obtained by changing the bridge circuit and primary sensing element.

This flexibility . . . coupled with design *simplicity*, construction *ruggedness*, performance *dependability*, operational *accuracy* is why more and more operators are specifying *ElectroniK* Potentiometers for indicating and recording power plant variables.

Check the flexibility features . . . then call in your local Honeywell engineer for a discussion of how they can add to your operating efficiency. Write for copies of Data Sheets 9.1-1, 9.1-3, and 9.1-7. MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 4568 Wayne Ave., Philadelphia 44, Pa. Offices in more than 80 principal cities of the United States, Canada and throughout the world.

MINNEAPOLIS **Honeywell**

BROWN INSTRUMENTS

WHEREVER YOU USE WOOD...

IN THE SOUTH, prolonged high temperatures cause light-bodied preservatives to leach and evaporate from the wood, thus exposing the wood to termite attack and decay. Barrett* Coal-Tar Creosote, heavier bodied and of lower volatility, prevents this condition. It stays in the wood longer under all conditions—doesn't "run out" on the job.

IN THE NORTH, poles must resist the tremendous weight of frequent sleet storms. Avoid preservatives which *weaken* the wood. BARRETT Coal-Tar Creosote allows poles to retain their maximum strength, and helps to keep the poles at their best and hold the lines aloft.

IN THE DESERT, crossties broom, shatter and split from extreme dryness and heat. Solutions made with BARRETT Coal-Tar Creosote retard this, and also reduce mechanical wear of crossties through their lubricating action on the wood fibers. In poles, heavy treatment with BARRETT Coal-Tar Creosote substantially reduces checking and splitting.

IN THE SWAMPS, forces of decay are almost at their maximum of destructive power. High moisture content and infection from other decaying wood and debris are ever-present menaces. Poles properly treated with BARRETT Coal-Tar Creosote have survived under swamp conditions for years.

IN FRESH WATER, many preservatives leach out of wood. BARRETT Coal-Tar Creosote resists this leaching action. Being only negligibly soluble in water, it is the preferred preservative for use on submerged wood structures, or those exposed to the powerful action of rapidly flowing water.

IN SALT WATER, marine wood-borers give a preservative its severest test. Of hundreds of preservatives that have been tried through the years, *Coal-Tar* Creosote is the only one that has proved consistently effective against teredos, limnoria and other salt-water enemies of wood.

THE BARRETT DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.

Use Barrett*

*Reg. U. S. Pat. Off.

Only coal-tar creosote wood preservative has been used long enough and widely enough to have proved its effectiveness under all conditions.

COAL TAR CREOSOTE

THE NEW

Polyken®

INDUSTRIAL TAPES

TAILORED TO YOUR JOB

Sealing the cargo compartment of a pressurized plane cabin with *Polyken* No. 223

The tape that put a safety belt around an airplane's air!

Thanks to pressurized cabins—and a new kind of tape—the only breathtaking thing about the high-altitude flights of Braniff International Airways is . . . the service and the scenery.

Yes, we said *tape*. For tape has proved to be not only the best but the most *economical* material for sealing up door cracks, seams, and all air "escape" routes around a plane's pressurized cabin. For a job as vital as this, Braniff sought out a "tape tailored to the job."

Our engineers suggested *Polyken* No. 223. This tape, one of over 100 special *Polyken* tapes, sticks and *stays* stuck—in hot or cold, at ground level or 20,000 feet up. What's more, its tough cloth backing conforms to irregular surfaces and is extremely resistant to abrasion.

Small wonder that *Polyken* No. 223 is the tape specified for this important job on Douglas Aircraft today.

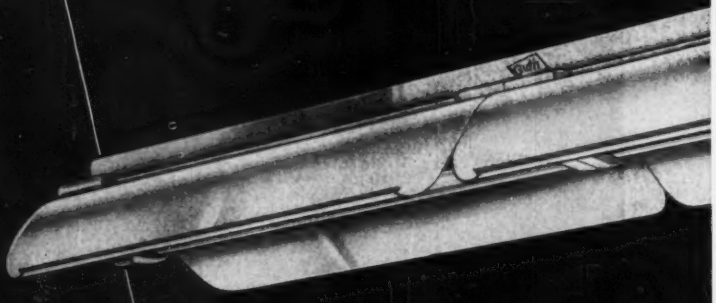
Got a tough job for tape?

We tell you the Braniff story as an example of how tape that's "tailored to your job" can do things you never dreamed tape could do. Let us study *your* problem, and we'll come up with a tape that will save you money, time and effort. That's a challenge. Won't you take us up on it?

GET THIS FREE BOOKLET! To help you find the tape "tailored for your job," write for your free copy of "Tape is a Tool." Address *Polyken*, Dept. EWF, 222 W. Adams St., Chicago 6, Illinois, or see your *Polyken* distributor.

Polyken Industrial Tape, Department of Bauer & Black, Division of The Kendall Company

it's all Polar Bear White



for 4′ and 8′ lamps

GUTH WYTE-LINER with AIRFLOW channel

A NEW IDEA FOR BETTER LIGHTING IN FACTORIES

White INSIDE and OUTSIDE... 300° Permalux or PORCELAIN ENAMEL!

- give improved brightness ratios
- take the gloom off the ceiling
- eliminate deep shadows and strong contrasts
- easy to clean—even in coal mines

Guth LIGHTING

THE EDWIN F. GUTH COMPANY / ST. LOUIS 3, MISSOURI

Leaders in Lighting Since 1902

for better sight and better light

Lighting for production to improve precision vision

Avoids gloomy, depressing ceilings with irritating, strong light and shadow contrast. Wyte-Liners spread brightness, cheerfulness, create better seeing and better working conditions.

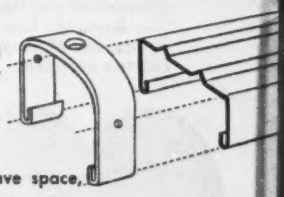
AIRFLOW VENTILATION

provides natural air circulation along entire channel to increase ballast life and efficiency.

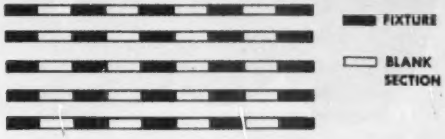
EASY INSTALLATION

wide choice of mounting methods . . . continuous or individual

- *sliding hangers*
- *telescope channels*



interchangeable parts save space, time and money, easy to install



one of many mounting possibilities: alternate fixture and blank space with covered, continuous wire way

Guth

GUTH WYTE-LINERS

in 2 and 3 40-watt light units, for 4-and 8-ft. Slimline in 4-and 8-ft. lengths.

GUTH WYTE-LINERS

are now in production and will be available soon.

Our 16-page catalog gives you all details. Just fill out this coupon and mail to us. No obligation.

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2615 Washington Avenue, St. Louis 3, Missouri

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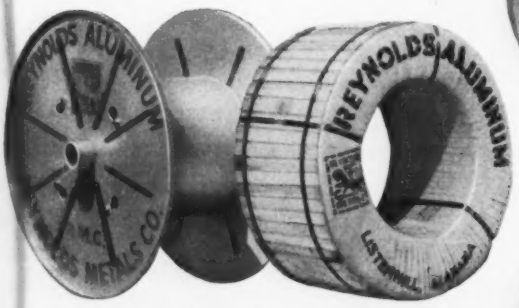
NOW 4 Reynolds Master Reels Do the Work of 100 Wooden Reels

Handle ACSR quicker, more economically
Eliminate inventory and exchange

Almost every cable user wants to convert to the modern Reynolds ACSR Master Reel and Coil system. And no wonder! These smart operators eliminate *all* problems connected with wooden reels. The Reynolds Master Reel eliminates handling, storing, record keeping, as well as cutting damage cost to a minimum.

Reynolds Master Reel and Coil are easily assembled by linemen right on the job.



Reynolds Master Coils hold the same amount of conductor as conventional wooden reels. The cable is carefully waterproofed, lagged and banded—completely protected against rough handling. The Reynolds Master Reel is all metal, quickly taken apart and put back together around the Master Coil. It is far sturdier than a wooden reel and can be used over and over again.

Find out about this revolutionary method of solving your cable and reel problems. You will cut your costs with this time- and money-saving cable handling method.

Reynolds Master Reel and Coil save time, money, labor —are sturdier than wooden reels.

FREE ACSR MANUAL FOR ENGINEERS CONTAINS COMPLETE INFORMATION, CHARTS AND TABLES. Please request this booklet on your business letterhead.

For Complete Information

see your Reynolds distributors listed below or write direct to Reynolds Metals Company, 2584 South Third Street, Louisville 1, Kentucky.

Westinghouse Electric Supply Co., New York, N.Y. (And branches) • North Coast Electric Co., Seattle, Wash. Griffin Manufacturing Co., Dallas, Texas • Southern Electric Supply Co., Houston, Texas • Williamson Sales Co., Shreveport, Louisiana (And branches) • California Electric Supply Corp., San Francisco, California

REYNOLDS METALS

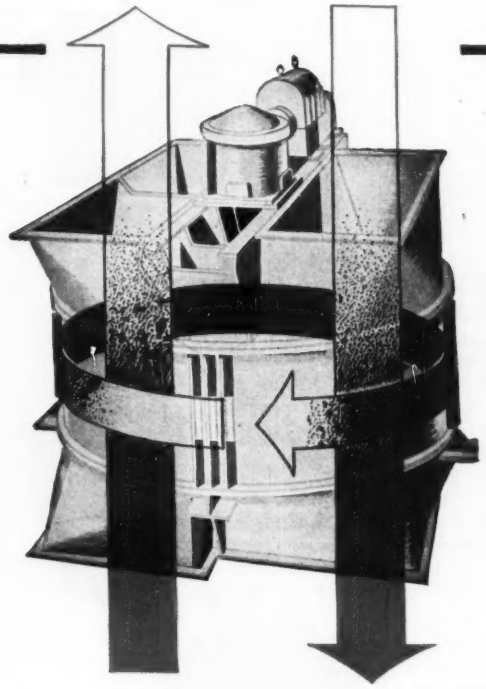
REYNOLDS ALUMINUM

MODERN DESIGN HAS ALUMINUM IN MIND

more than 200,000,000 lbs/hr of post-war steam generating capacity

equipped with *Ljungstrom*

AIR PREHEATERS



Here indeed is impressive evidence of the wide acceptance of the Ljungstrom air preheater. Since the war the total capacity of steam generating units equipped with Ljungstrom air preheaters, installed, under construction or on order in industrial and utility plants throughout the country comes to well over 200,000,000 lbs of steam per hr.

The reasons for the steadily increasing preference for the Ljungstrom air preheater are simple enough. The continuous regenerative counterflow principle assures maximum heat transfer with minimum weight and size. Flexible and compact, it may be used in a wide range of applications. Its proven reliability and low maintenance eliminate costly shutdowns.

If you are planning to build a new plant or modernize an old one, investigate the possibilities of the Ljungstrom. The specialized experience of Air Preheater engineers is at your disposal, to aid in effecting the most economic heat recovery from flue gases.

The Ljungstrom operates on the continuous regenerative counterflow principle. The heat transfer surfaces in the rotor act as heat accumulators. As the rotor revolves the heat is transferred from the waste gases to the incoming cold air.

THE AIR PREHEATER CORPORATION

60 EAST 42d STREET • NEW YORK 17, NEW YORK

Pennsylvania

...an important name in transformers

Sound management, thorough knowledge of the product, and good workmanship combine to make Pennsylvania Transformer Company an important Name in the transformer industry.

The trust placed in the Pennsylvania product is emphasized by the fact that orders for 60,000, 70,000, and 100,000 Kva transformers are now being filled in Pennsylvania's modern plant.

A special planning department, which devotes all of its time to research and development work, has introduced many fundamental transformer improvements. These include the Pole Star Distribution Transformer, the Standard Parts Power Transformer, the Straight Line Tap Changer, Precompressed Helical and Pancake Coils; and Pennsylite, a new laminated low loss material for terminal boards in underload tap changing equipment.

Pennsylvania TRANSFORMERS

Pennsylvania TRANSFORMER COMPANY

CANONSBURG, PA. *Greater Pittsburgh District*

DISTRIBUTION

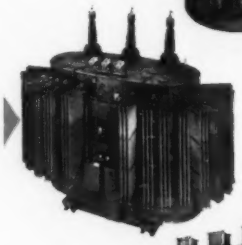
3 Kva to 500 Kva, Up to 66,000 Volts

50 Kva, single phase, 2400-120/240 Volts

POWER

667 Kva to 100,000 Kva, Up to 230,000 Volts

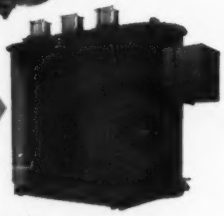
35,000 Kva, 3 phase, 115,000Y - 13200Δ Volts



FURNACE

All Kva sizes and current ratings

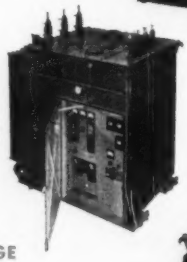
15000 Kva with motor-operated tap changer



INTEGRAL UNIT SUB-STATIONS

Single circuit and double ended unit substations

1500 Kva single circuit unit substation



STEP VOLTAGE REGULATORS

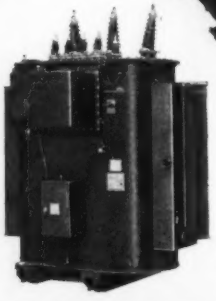
Up to 750 Kva for plus or minus 10% regulation in 32 steps

300 Kva, 13800 volts, 32-5/8% taps

LOAD RATIO CONTROL TRANSFORMERS

For changing transformer taps under load.

2500 Kva, 3 phase, 66000-2500/4330Y X7500/12990Y Volts



CREOSOTE OIL

leads the parade

● It's only natural to look closely at service records when you specify a preservative for your poles and crossarms. And no other preservative can match creosote oil's records of service in adding years of life to treated wood and reducing replacement costs.

These records are important reasons why the wood-preserving industry uses far more creosote oil every year than all other preservatives combined. And they're important reasons, too, why you should insist on this *tested* preservative.

When specifying creosote oil, insist on U·S·S Creosote Oil. It's a completely *uniform* product, made to give you uniformly good results. For more information, contact our nearest sales office listed below.

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71 Broadway, New York 6, N. Y.
208 South La Salle St., Chicago 90, Ill. 1509 Terminal Tower, Cleveland 13, Ohio
Brown-Marx Building, Birmingham 2, Ala. 25 Beale St., San Francisco 5, Calif.
United States Steel Export Company, New York

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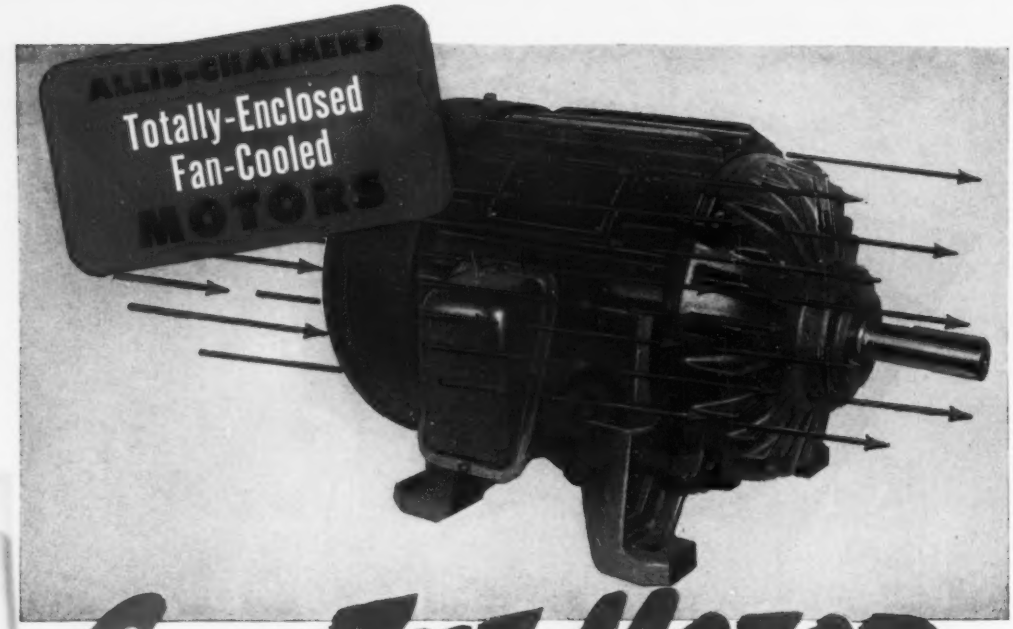
CREOSOTE OIL

UNITED STATES STEEL



GET THE MOTOR that Cleans Itself

DROP YOUR MAINTENANCE COSTS to a new low by reducing motor cleaning operations and reducing inspections and overhauls. Tests have proved that on most applications totally-enclosed, fan-cooled motors more than pay back their extra cost in reduced maintenance. And this new Allis-Chalmers Type APZ tefc motor makes maintenance costs lower than ever before on this type of motor.

Here's Why

Concealed air passages and pockets have been eliminated; dirt cannot build up to cause overheating. Cooling air is blown over the ribbed cast iron frame and bearing housings carrying dirt away with it. How about oily dirt that sticks? It can be wiped or blown off without stopping the motor.

Rigid Construction

The frame is rigid cast iron which not only has high inherent corrosion resistance, but also holds bearings in alignment. Bearings are pre-lubricated at the factory and should need no attention for years. Tapped holes with pipe plugs to permit regreasing and to provide grease relief are standard equipment.

Get All The Facts

The new Allis-Chalmers Type APZ totally-enclosed fan-cooled motor is built in all NEMA standard frame sizes from 224* to 505. Also in explosion-proof type. Your A-C Authorized Dealer or District Office has complete information. Call today, or write Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for Bulletin 51B6144.

A-3398

Sold . . .
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by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

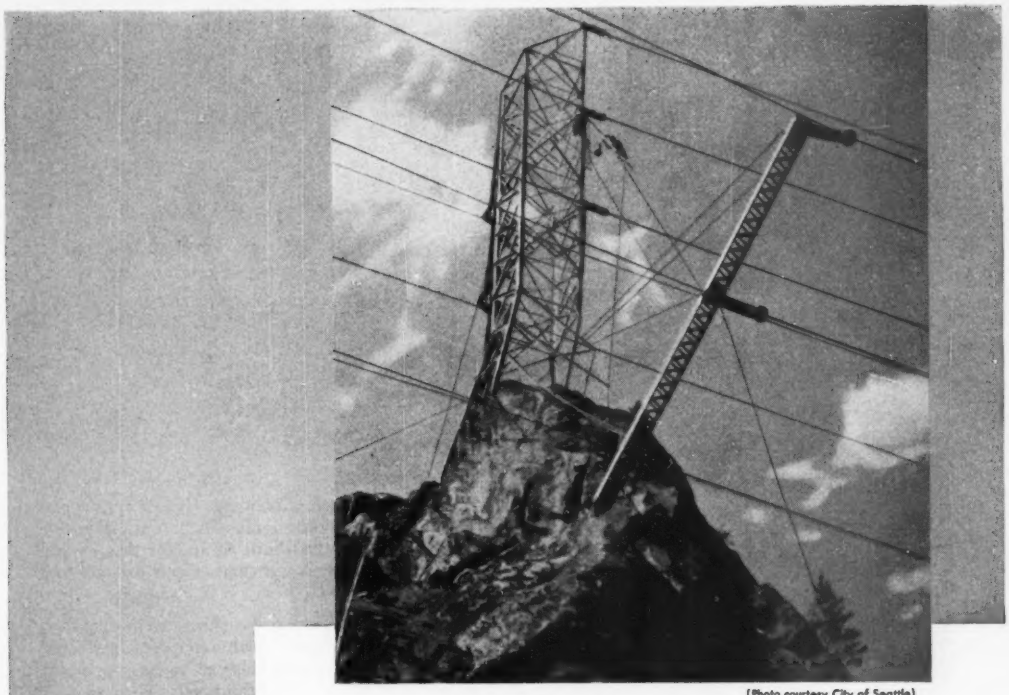
TEXROPE — Belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.

PUMPS — Integral motor and coupled types from ¾ in. to 72 in. discharge and up.

Texrope and Vari-Pitch are Allis-Chalmers trademarks.

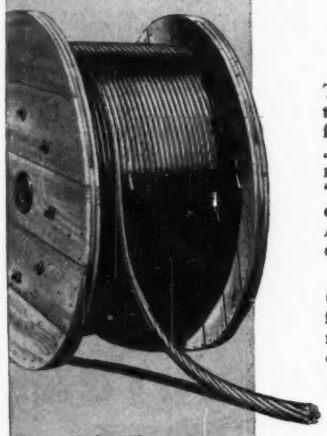
ALLIS-CHALMERS

*Similar design non-ventilated motors Type APK, also available in frames 203 to 224 inclusive.



(Photo courtesy City of Seattle)

Another Way to Skin a Cat...



This spar arm carries 165-kv transmission line to make room for 230-kv line in rugged terrain ... both Alcoa ACSR. Where terrain is difficult, there are usually "several ways to skin a cat" and easy-to-handle, lightweight Alcoa ACSR often proves the easiest—and the best.

Alcoa made the first ACSR (Aluminum Cable Steel Reinforced) ... did the research that made mile-long spans possible, developed installation methods that made them practical.

Alcoa's storehouse of knowledge and 63 years' experience with aluminum and electricity is your assurance that you're dealing with those who can best help you solve your transmission line conductor problems.

Although the rearmament program prevents unrestricted use of aluminum, we are ready to help you with the planning required for power transmission projects.

TECHNICAL HELP—NO OBLIGATION

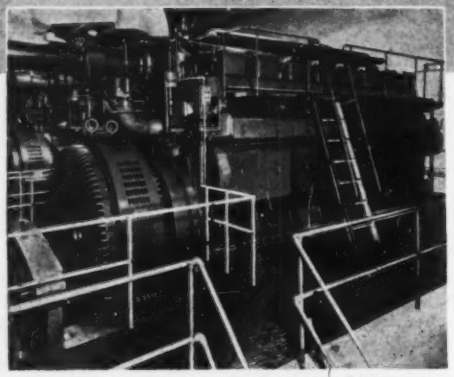
Write for help, advice or technical literature. Address: ALUMINUM COMPANY OF AMERICA, 2100F Gulf Bldg., Pittsburgh 19, Pennsylvania.

ALCOA FIRST IN ALUMINUM FIRST IN **A·C·S·R**

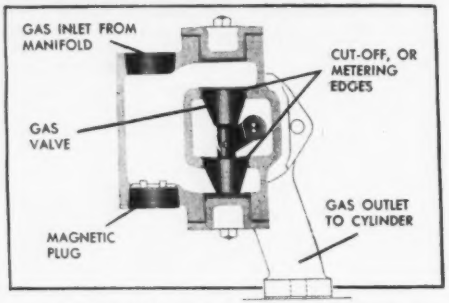
Aluminum Cable Steel Reinforced

They're Handling Expanding Power Loads The Fast, Low Cost Way:

Iowa Utility Company, Like So Many Others, Uses Worthington Dual Fuel Units For Uninterrupted Service On The Cheapest Fuel Available



A Worthington Supercharged Dual Fuel Engine in the Oskaloosa plant — part of the Iowa Power And Light Company System.



WORTHINGTON MICRO-METERING GAS VALVE
One for each cylinder

Used on Spark Ignition and Dual Fuel Engines — Governor controlled — Individually adjusted.

Assures: — Equal cylinder loading — Smooth running at all loads — Better speed regulation — Lower maintenance.

Full load operation, 24 hours a day, is routine performance for Worthington Dual Fuel Engines. They're designed and built to do just that — and they're doing it for power companies in communities all over the world.

They're saving money for their users every day, too, because of their Worthington-pioneered dual fuel feature that enables them to operate on gas or oil, or any combination of these fuels. Also, without losing load, they can instantly be changed over from one fuel to the other.

When gas is your fuel, only a very small amount of pilot oil is needed for ignition. Micro-metering valve (see drawing) on each cylinder provides equal distribution of gas for smooth, steady operation. Supercharging assures maximum economy through high thermal efficiency with either fuel.

BESIDES FUEL SAVINGS—

Lubrication and maintenance costs have been cut to a minimum through an effective system of "hot-spot" lubrication, according to users of Worthington Dual Fuel Engines. Why not get the whole story that proves *there's more worth in Worthington?* Write to *Worthington Pump and Machinery Corporation, Engine Division, Buffalo, New York.*

WORTHINGTON

E1-2

YOUR PARTNER IN POWER PROGRESS

Diesel engines, 150 to 3,520 hp . . . gas engines, 175 to 3,520 hp . . . dual fuel engines, 225 to 3,290 hp.

WORTHINGTON-BUILT AUXILIARIES

Balanced Angle Compressors

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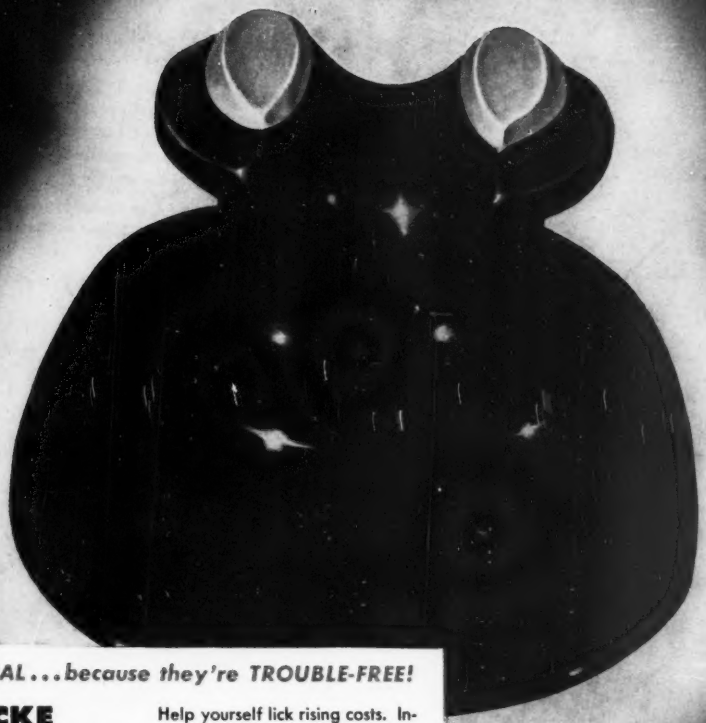
Evaporative Type Engine Water Cooler

LOCKE

Presents masterpieces of insulator engineering



ECONOMICAL . . . because they're TROUBLE-FREE!

LOCKE LOW VOLTAGE PIN TYPE INSULATORS

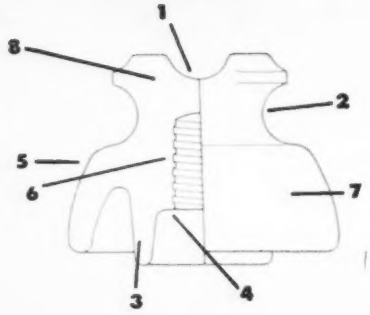
typified by

No. 9995

Help yourself lick rising costs. Install Locke Low Voltage Pin Types . . . first developed by Fred M. Locke in 1893. The millions now in active service . . . some installed as early as 1894 . . . give ample proof of their economical, trouble-free performance. Always specify them.

Presenting A MASTERPIECE OF INSULATOR ENGINEERING

The LOCKE low voltage Pin Type Insulator



LOCKE DESIGN brings you ALL these advantages

1. Smooth, deep, bell-mouthed top wire groove accommodates conductors as large as 4/0 ACSR with armor rods.

2. Deep, well-formed side wire groove provides positive support for conductors placed here for angles. Will take conductors as large as 4/0 ACSR with armor rods.

3. Deep, open corrugations develop full leakage distance and prevent bridging during rain.

4. The inner petticoat flares out quickly from pin. This assures freedom from arcing from tip of inner skirt to pin. Thus, insulator leakage distance is fully effective.

5. Uniformly smooth glazed surface means easy natural cleaning by wind and rain. It also helps insulator maintain original excellent electrical characteristics.

6. Accurately formed, glazed pin hole threads assure tight fit on pin; minimize possibility of radio interference.

7. Compression glaze . . . a Locke development . . . combined with finest grade Locke wet process porcelain assures high resistance to damage from thermal shock and mechanical impact. This also means Locke insulators can be handled faster in construction without danger of chipping or breaking.

8. On NP types the head, conductor grooves and pinhole are glazed with Locke semi-conducting Metaglaze for corona and radio noise suppression.

9. Locke Pin Type insulators conform fully to N.E.M.A. Standards.

YOU ARE EQUALLY SURE of getting a masterpiece of design when you specify other products in the complete line of Locke Insulators and suspension hardware. Each pays off in superior performance on transmission and distribution lines, generating stations, sub-station and electrical apparatus.

LOCKE
INCORPORATED
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LOW VOLTAGE PIN TYPE INSULATORS

HIGH VOLTAGE PIN TYPE INSULATORS

SUSPENSION INSULATORS

SWITCH & BUS INSULATORS

SPOOL INSULATORS

CUT INSULATORS

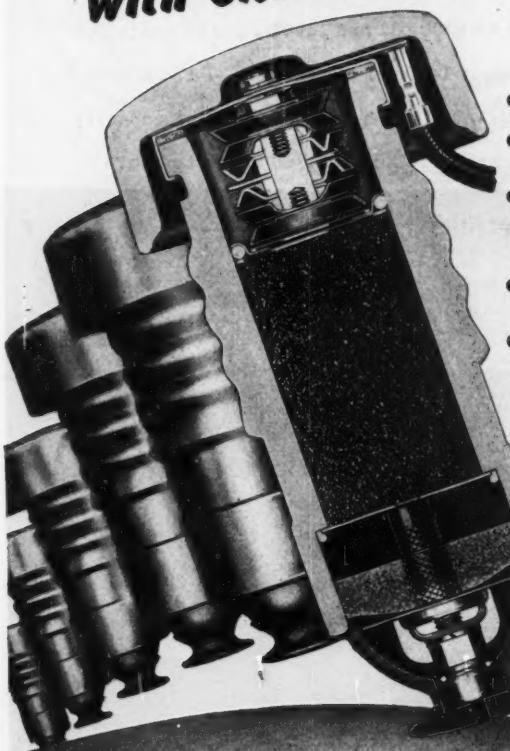
LIQUID-FILLED BUSHINGS

SUSPENSION & STRAIN CLAMPS

SUSPENSION HARDWARE

ENTRANCE BUSHINGS

PROTECTION AT ITS BEST with CRYSTAL VALVE'S



- Low IR voltage drop
- Ample surge discharge capacity
- Extremely marked valve action for follow current interruption
- No measurable deterioration
- Long service life

Lashing rainstorms . . . sub-zero temperatures . . . blistering summer heat can't affect the true valve action of Crystal Valves. The outstanding electrical characteristics of Oxidized Silicon Carbon grain used only in Crystal Valves make it ideally suited for application in lightning arrester operation. You get split-second protection for your power equipment against lightning "black-outs"—freedom from failure.

Get the complete benefits of proved protection . . . specify Crystal Valves for your power line equipment.

Write Dep't 1709 for latest technical data on lightning arresters and their installation. Ask for CV catalog. No obligation.

ELECTRIC SERVICE MANUFACTURING CO., PHILA. 32, PA.

CRYSTAL VALVE

LIGHTNING ARRESTERS

Lightning Arresters Valve Elements

by

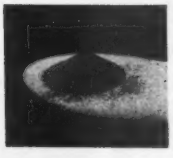
J. R. McFarlin, Vice President

ELECTRIC SERVICE MANUFACTURING CO.

The valve element of a valve type lightning arrester is always of interest to both the designer and to the user of such arresters. It operates much like a valve in that it can be "shut" or "open"—shut when its resistance is high, open when its resistance is low; it will show an infinite number of resistance values between given values of high and low. In a lightning arrester it is in series with a spark gap, the gap ordinarily connected to a line and the valve element connected to ground.

Lightning surges sparking over the gap will discharge to ground through the valve element, and the resistance of the element will change depending on the magnitude of voltage impressed across it or the current flowing through it—high resistance for low voltage or current, low resistance for high voltage or current; because of such characteristics it is referred to generally as a "non-linear" resistor.

Much research has been done on various materials possessing these "non-linear" resistance characteristics; perhaps the most has been based on silicon carbide crystals, both alone and in combination with other materials. Our Company has used silicon carbide of various characteristics, both in rod, block and discrete forms for lightning arresters over a period of more than 50 years; since 1925 usage has been entirely confined to crystals in discrete form rather than in rods or blocks.



In 1933, in cooperation with the Carborundum Company, *oxidized* silicon carbide grain was developed and has been used in discrete form for Crystal Valve lightning arresters since that time; this grain is produced by a rather complex treatment where the outer layer of each grain is changed from the solid crystalline silicon carbide to a layer of porous silica, the core of the grain still being the original silicon carbide. As compared with regular electrical silicon carbide, oxidized silicon carbide is characterized by lower unit internal impedance, by more marked inverse voltage/resistance or non-linear characteristics, by higher valve or arc-suppressive ability and by marked increase in thermal or current carrying capacity.

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Does all this add up to specialized and specific know-how?

. . . discounting past performance and metallurgical research, we have in work, at the present moment, orders for critical or complete utility power piping for units with operating conditions up to 2300 psi and 1100F . . . 19 units for service at 1000F or above . . . pressures of 1400 psi or higher . . . 17 units of the REHEAT type . . . totaling to more than 2-1/2 million new kilowatts of capacity.

Does all this add up to specialized and specific know-how of value to you?

NEWS FOR OPERATORS IN WESTERN CANADA!

Canadian Kellogg Company has established complete shop facilities for the fabrication of all types of piping at **EDMONTON** in Alberta Province. Inquire directly or through any Kellogg office.

To enable temperatures, pressures and chemicals use

M. W. KELLOGG

piping and process equipment

Special studies of unusual problems such as graphitization to assure long life and low maintenance.

Metallurgical research by recognized specialists who have made major contributions in this field.

KELLOGG 50th ANNIVERSARY 1901 - 1951

Exclusive Equipment for accurately analyzing stresses in piping and providing unique data for critical installations.

Complete facilities for the fabrication of steel products from simple forgings to specially cast bi-metallic devices.

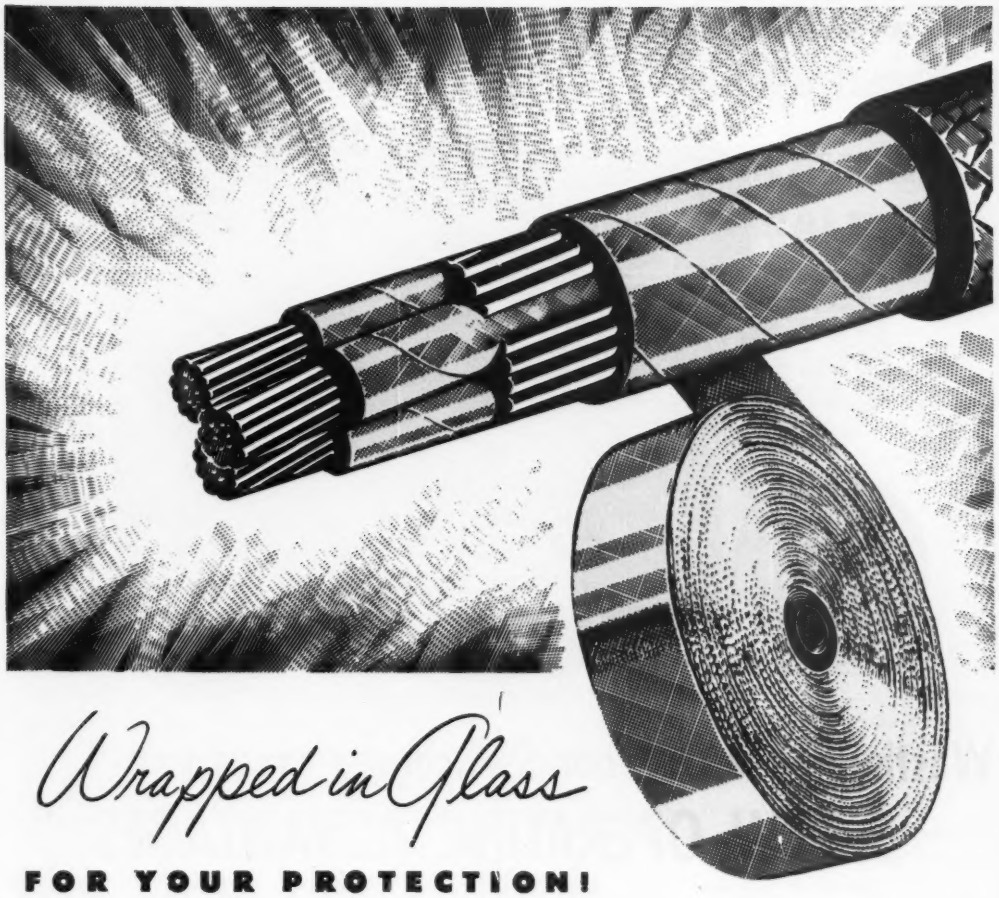
Top welding performance in shops and in the field by welders accustomed to working under X-Ray checks.

Quality control, devised by metallurgical experts, embracing forming, heat treating and non-destructive testing.

Pressure Vessels
Vacuum Vessels
Fractionating Columns
Drums and Shells
Heat Exchangers
Process Piping
Bends and Headers
Giant One-Piece Heads
Forged and Welded Fittings
Radial Brick Chimneys

★

The M. W. Kellogg Company, Inc. (A Subsidiary of Pullman Incorporated) — Offices in New York, Jersey City, Buffalo, Los Angeles, Tulsa, Houston, Toronto, London and Paris



Wrapped in Glass

FOR YOUR PROTECTION!

To protect you from power transmission failure . . . to save you the cost of frequent cable replacement . . . many top-flight cable makers are using varnished Fiberglas* fabrics as dielectric tape in power cable.

Used as primary and secondary insulation on conductors, tough, low-cost Fiberglas varnished tapes provide excellent electrical properties and, in addition, resist extreme moisture conditions.

Today, when continuing power transmission is a *must* in stepped-up production, it will *pay* you to specify Fiberglas components in power cable, as well as most other wires and cables.

OWENS-CORNING FIBERGLAS *Yarns*

*Fiberglas is the trade-mark (Reg. U. S. Pat. Off.) of Owens-Corning Fiberglas Corporation for a variety of products made of or with fibrous glass.

FIBERGLAS IS IN YOUR LIFE . . . FOR GOOD!

NOTE: Because of increasing military and civilian demands for Fiberglas yarns, our customers are unable to get all they need. We are building new facilities to help meet these demands.

Owens-Corning Fiberglas Corporation
Electrical Sales Division, Dept. 858
16 E. 56th Street, New York 22, N. Y.

Please send your new booklet describing wires and cables insulated with Fiberglas Yarns.

Name_____

Title_____

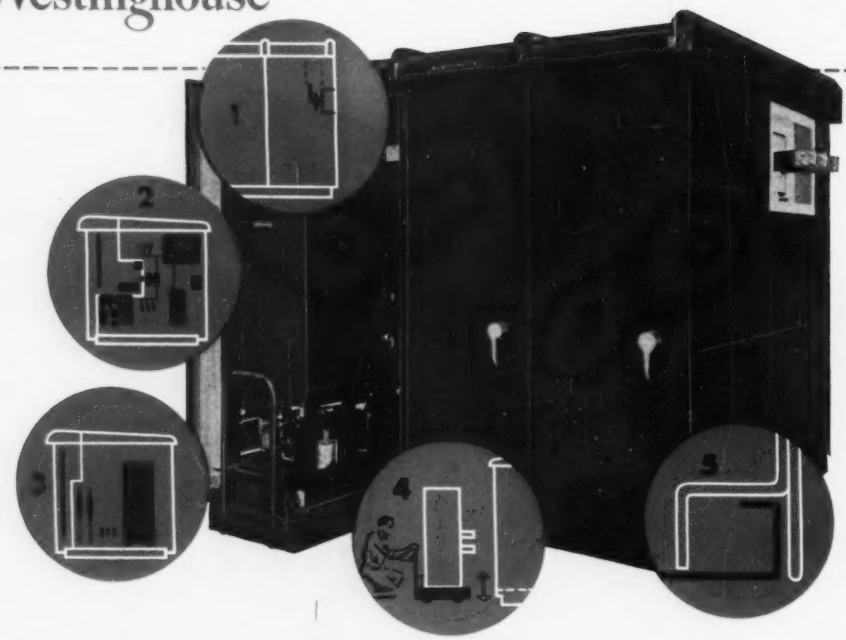
Company_____

Street_____

City_____ Zone____ State_____

YOU CAN BE **SURE**.. IF IT'S

Westinghouse



Westinghouse Outdoor Switchgear gives you 5 NEW OPERATING ADVANTAGES

Westinghouse brings you redesigned 5-Kv Outdoor Metal-Clad Switchgear with improvements that add up to time and cost savings in installation, operation and maintenance.

Greater accessibility of operating parts . . . better ventilation and weatherproofing . . . improved appearance are among its advantages that give you more for your switchgear dollar.

1. Control knife switches are in easy-to-reach position.
2. Auxiliary compartments provide better equipment access. More headroom makes inspection and maintenance easier.
3. Enclosure makes possible use of two potheads for two 3-conductor cables without sacrificing the full-length instrument panel. Adequate clearance is afforded behind the panel at the pothead elevation for semi-flush Flexitest cases and average-depth Type W switches.
4. Platform height is adjustable. Transport truck provides adjustability for slight variations in pad level.
5. Newly designed doors with flanged edges provide extra rigidity and improved weather seal.

Get complete facts from your nearby Westinghouse representative, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

* * *

See "Electrical Proving Ground" . . . the dramatic story of the Westinghouse High Power Laboratory in sound and color motion picture. For details, write Westinghouse Film Division, Box 868, Pittsburgh 30, Pennsylvania. J-60743

Westinghouse

METAL-CLAD SWITCHGEAR

Looking ahead to years of service

CHASE ANTIMONIAL ADMIRALTY

(a patented alloy)

If you want condenser tubes that will stand up for years under tough field conditions, remember . . Chase Antimonial Admiralty* Condenser Tubes last longer! It's the antimony that does it!

These great condenser tubes have enough antimony to resist dezincification. And, in addition, antimony is one inhibitor that will not weaken the tube. The metal starts with the right grain structure and retains it . . . it stays tough and withstands the stresses of heavy duty assignments.

You'll do better with Chase Antimonial Admiralty Condenser Tubes! Send coupon for FREE book on Condenser and Heat Exchanger Tubes.

CHASE WAREHOUSE STOCKS:
NEW YORK, BALTIMORE, NEW ORLEANS, LOS ANGELES,
also carried by —
Vinson Supply Co., Tulsa
Standard Brass & Mfg. Co., Houston.

*U.S. Pat. No. 2,061,921

Chase BRASS & COPPER

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

• *The Nation's Headquarters for Brass & Copper*

Albany†	Cleveland	Kansas City, Mo.	New York	San Francisco
Atlanta	Dallas	Los Angeles	Philadelphia	Seattle
Baltimore	Denver†	Milwaukee	Pittsburgh	Waterbury
Boston	Detroit	Minneapolis	Providence	
Chicago	Houston†	Newark	Rochester†	(†sales office only)
Cincinnati	Indianapolis	New Orleans	St. Louis	

FREE CHASE BOOK discusses corrosion problems and selection of proper alloy for condenser and heat exchanger tubes.

Chase Brass & Copper Co., Dept. EW651
Waterbury 20, Conn.

Please send me Free Book on Condenser and Heat Exchanger Tubes.

Name_____

Firm_____

Position_____

Street_____

City_____ **State**_____

FITS THE HAND
FITS THE WORK
FITS THE BELT

This tag says
"PRETESTED"
It guarantees that each individual tool tested 100% satisfactorily before it left the factory.

● Here's one of the finest tools ever to bear the Crescent name. It's an improved, easier-to-use CRESTOLOY Round Nose Lineman's Pliers... streamlined for better handling, better work and easier carrying in the belt. Forged from special "Crestoloy" steel, it's two ounces lighter, yet just as strong as the heavier conventional model. Its cutting edges are carefully hand-honed to provide lasting sharpness. The milled teeth in the nose assure a non-slip grip on wire or other work. The handles fit the hand "like a glove."

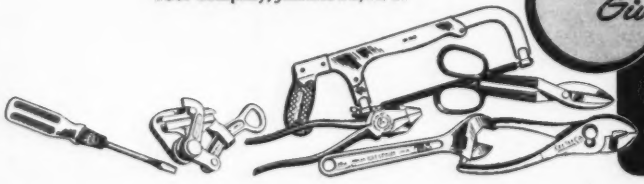
No. 2150
Crestoloy 8" Lineman's Pliers. Available also with insulated handles.

CRESCENT TOOL COMPANY, JAMESTOWN, N. Y.

"Crescent" is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by Crescent Tool Company, Jamestown, N. Y.

CRESCENT TOOLS
Give Wings to Work

Sign of the Artisan
Symbol of Excellence



Everson Electric Co. counts on SILASTIC TAPE "...When insulation must stand up at 500° F"

For outstanding insulation characteristics and for lasting performance at high temperatures, the choice is Silastic* Tape at Everson Electric Company, Allentown, Pa., manufacturers of armature, field and stator coils for railway and heavy-duty industrial applications.

"The ability of Irvington's Silastic Tape to stand operating temperatures up to 500° F increases the life of our coils," says Everson, "and it saves space *too*."

Here are some *other* reasons why so many leading manufacturers turn to Silastic Tape:

The combination of Fiberglas** cloth and Silastic rubber impregnation and coating gives high tensile strength and excellent chemical resistance, even at high temperatures.

After vulcanizing, Silastic Tape forms a solid insulation mass, free from voids or air pockets . . . moisture-proof, extremely abrasion-resistant.

Worth looking into, isn't it? Ask for the full story today!

*® Dow Corning **® Owens Corning Fiberglas Corp.

Send this convenient coupon now

Irvington

VARNISH & INSULATOR COMPANY

Irvington 11, New Jersey

Irvington Varnish & Insulator Company EWo-6/51
6C Argyle Terrace, Irvington 11, N.J.

Gentlemen:

Please send me technical literature on Silastic Tape.

Name.....

Company.....

Street.....

City.....Zone.....State.....

CON
Life Span
10th ANNIVERSARY
CONSOLIDATED

SOLIDATED

Celebrates its 10th Anniversary

with EVERY LIFE-SPAN Installation brightly serving!

AFTER 10 YEARS . . .

Every LIFE-SPAN Cedar Pole installation is perfectly sound with many years of service life-expectancy ahead.

Have you ever heard of a company who can point to *every* product they have turned out and say, "never a failure"? Most likely you have not! However, we at Consolidated can point to every Western Red Cedar LIFE-SPAN pole and proudly state that our research people are *still* searching for that first pole (whether it be in actual pole-line service or in our own testing grounds) which shows decay or any indication of deterioration.

It was just ten years ago that Consolidated began using the new famous LIFE-SPAN pole treatment. Today LIFE-SPAN poles are preferred in all climates by those who purchase or those who work with power poles. Once the LIFE-SPAN treatment is applied, Western Red Cedar poles simply cannot rot!

To be sure, to be doubly safe . . . Specify LIFE-SPAN Western Red Cedar poles.

For further information write any of the following:

PACE & HILL, INC.
Minneapolis, Minnesota
50 Church Street, New York, N. Y.

B. J. CARNEY & CO.
Spokane - Minneapolis

SCHAEFER-HITCHCOCK CO.
Sandpoint, Idaho
Suppliers for Joslyn Mfg. & Supply Co.

NAUGLE POLE & TIE CORP.
Chicago, Illinois

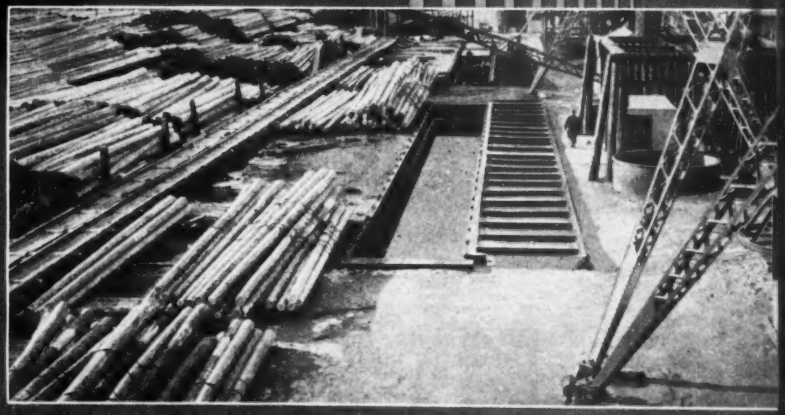
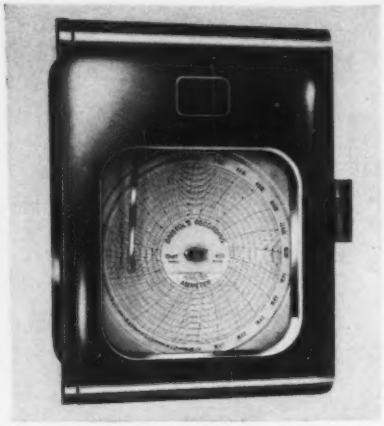
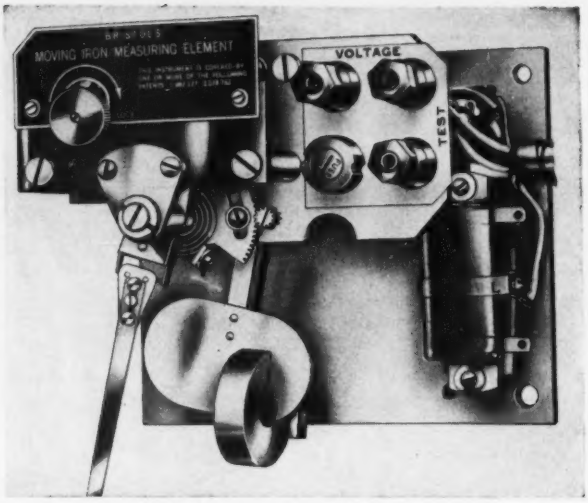


Photo shows both hot and cold, full-length submersion tanks in Consolidated Treating Yards, Minneapolis.

TREATING COMPANY • Mpls., Minn.



PERMANENT MOUNTING offered in three models: interchangeable surface and flush, surface-panel and flush panel. Note the pleasing, well-balanced appearance. Also: **PORTABLE INSTRUMENTS** are offered in two models: for setting on floor or table; for mounting on walls or poles and general service.



NEW MOVING-IRON MEASURING MECHANISM. High torque, low burden, rugged construction for assurance that the original calibration will be retained through years of service. Shock-absorbing stainless steel bearings.

NEW BRISTOL Series 500 RECORDING VOLTMETERS and AMMETERS

THE LATEST DEVELOPMENT IN ELECTRICAL MEASUREMENT

Outstanding for—High actuating torque... Low electrical burden... Stability of calibration... Dependable accuracy

Here is electrical measurement at its finest . . . most dependable . . . most convenient to use—the product of nearly 60 years of experience in building recording voltmeters and ammeters for almost every application.

The new moving-iron measuring mechanism is a type known for high actuating torque and low electrical burden . . . refined by Bristol engineers for greater accuracy and ruggedness.

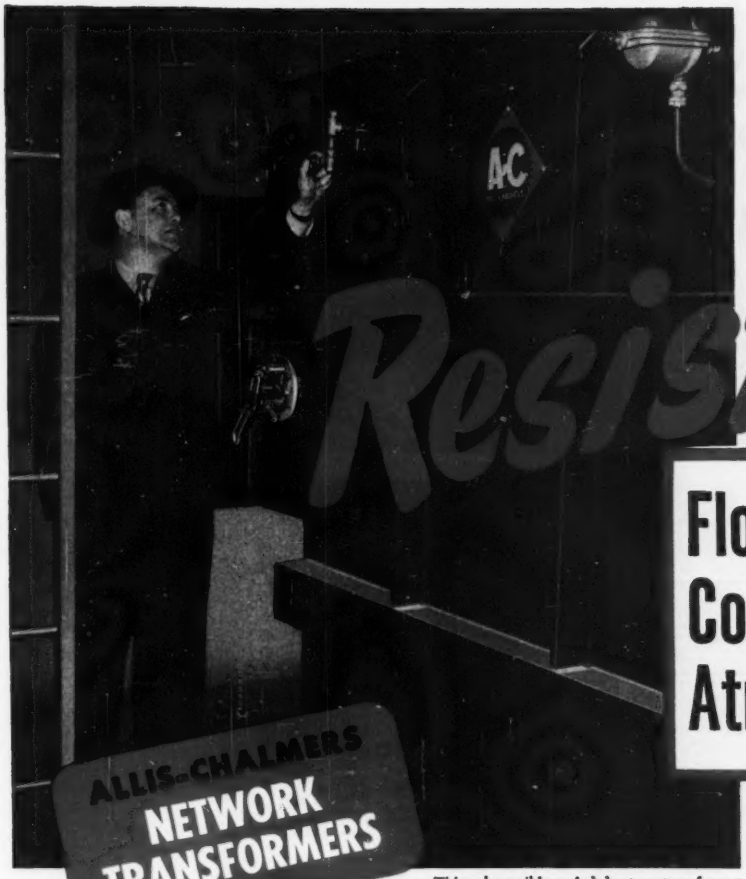
Other Bristol developments that assure convenience in use include the new Series 500 dust- and moisture-protected die-cast aluminum case, quick-set chart hub for easy chart changing, non-obscuring pen lifter, snap-on chart plate.

To keep up with the latest in recording instruments, send for Bulletin E1111, addressing THE BRISTOL COMPANY, 116 Bristol Road, Waterbury 20, Conn.

THE DEPENDABLE GUIDEPOST OF INDUSTRY

BRISTOL

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS



This submersible sealed dry type transformer operates with complete safety anywhere. Class H silicone insulation, 160° C rise.

Resists...

Floods and Corrosive Atmospheres

IN MAJOR ELECTRICAL systems coast to coast the A-C trademark on network transformers is a familiar sight. Wide acceptance of these transformers is no accident.

Acceptance is based on time proven construction details: circular coil design, outside core clamping, sturdy turn-to-turn insulation. Transformers are built to withstand heavy short circuit stresses. Their thermal capacity is high under the most severe load conditions.

Strongly constructed tanks withstand corrosive atmospheres and even complete submersion in areas where flooding is frequent. Undercoating compound protects surfaces most subject to corrosion. All surfaces are shot blasted and then given 3 coats of baked on paint. Main cover is welded to tank and eliminates large gasket.

SELECT FROM BASIC TYPES

Allis-Chalmers supplies all 3 basic types of network transformers: oil-filled, *Chlorextol* liquid filled or new sealed dry type. It's easy to select the right network transformer for the right job because Allis-Chalmers provides dimensions, ratings and qualified engineering service.

Call in your A-C representative early in your network planning. Get his unbiased recommendations on the best network transformer for your system. For more facts on network transformers write Allis-Chalmers, Milwaukee 1, Wis. for bulletin 61B6152A.

CHLOREXTOL is an Allis-Chalmers trademark. A-3278

OIL FILLED. Widely used because of over all economy and proved dependability. High in efficiency and reserve thermal capacity. Vault or subway types.

CHLOREXTOL LIQUID FILLED. Chlorextol liquid eliminates fire and explosion hazards. For use where safety codes require extra safety. Vault or subway types.

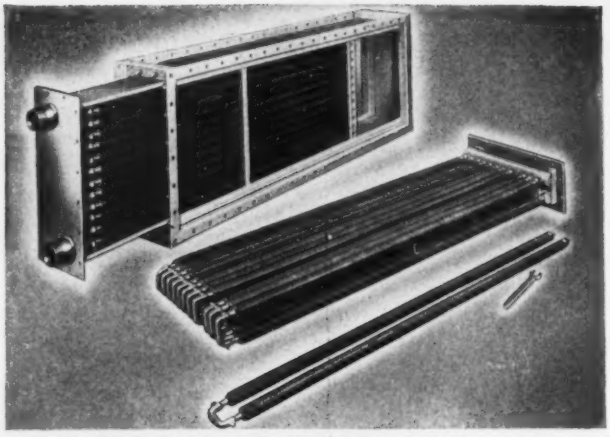
NEW SEALED DRY TYPE. Thanks to class H insulation no coolant necessary. Requires no internal maintenance. Eliminates fire and explosion hazards. Hermetically sealed.

ALLIS-CHALMERS

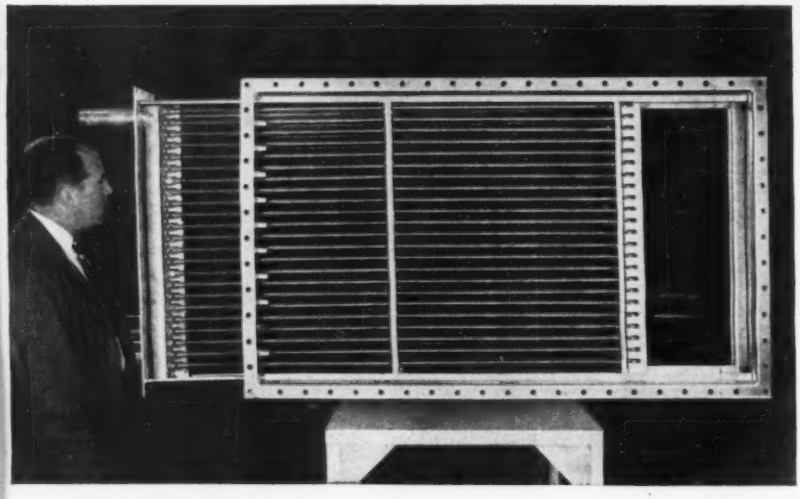
Facts you should know about

AMERICAN BLOWER HEAVY DUTY STEAM COILS

American Blower's Type H Heavy Duty Steam Coil has been developed for a single purpose: to furnish public utilities and industry with a heating coil designed and built in accordance with highest quality industrial equipment standards. It is a coil possessing strength, corrosion resistance and complete accessibility.



Above, Type H Heavy Duty Coil and component parts. The entire heating element is removable from the casing and can be completely dismantled for inspection, maintenance and repair. Individual tubes are replaceable.

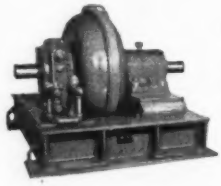


Type H Coils are available in a wide range of sizes and are designed, tested and guaranteed for operation with steam pressures to 350 lbs. gauge. Casing is heavy steel, welded airtight.

For detailed information on American Blower Type H Coils, write for Bulletin B-1318, or call our nearest branch office.

And if you'd like complete data on other American Blower power plant equipment — Mechanical Draft Fans, Fly Ash Precipitators and Gyrol Fluid Drives for boiler feed pumps and fan control—write, stating your requirements, or phone the nearest American Blower Branch Office.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO
Division of American Radiator & Standard Sanitary corporation



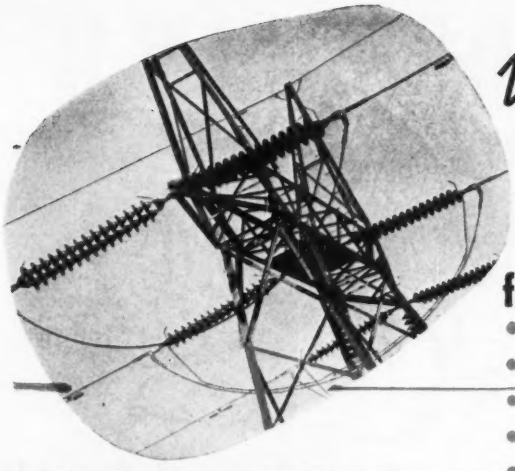
Gyrol Fluid Drives

for Mechanical Draft Fans are also a part of American Blower's wide range of products which serve America's leading public utilities.

YOUR BEST BUY AMERICAN BLOWER POWER PLANT EQUIPMENT

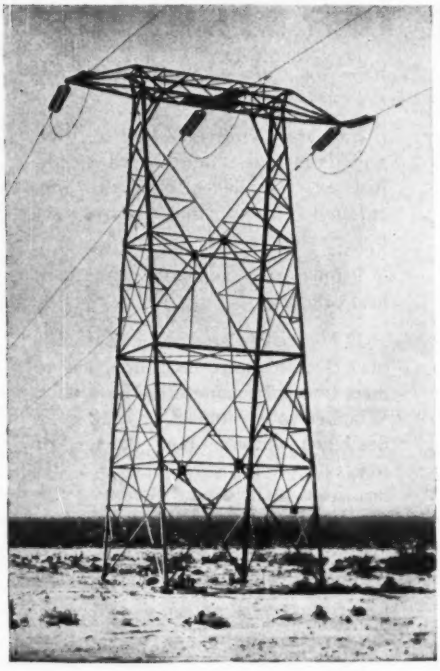
Serving home and industry

AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON



Demand PROOF OF PERFORMANCE

for Superior Insulator Quality



All insulators are not alike. That is why Thomas welcomes competitive tests. For example . . . in 1938, a large western 230-kv line was under construction. Insulator manufacturers were invited to send samples of their 10-inch suspension insulators for competitive tests.

RESULT: The whole job . . . 50,000 suspension units . . . was awarded to The R. Thomas and Sons Co. That the Customer's choice was right is evidenced by the following telegram received recently:

"Approximately 37,000 Thomas ten-inch suspension insulators were installed on our 230-kv lines in 1938. Balance of 13,000 units used for general construction purposes at different voltages. Have given entirely satisfactory performance."

After all is said . . . it's still quality that counts plus proper designing, precision manufacturing . . . and PROOF OF PERFORMANCE. Since the beginning of the Electrical Industry, Thomas has been supplying porcelain for the most difficult insulation problems. Why gamble?

SPECIFY THOMAS INSULATORS—THE BEST BY LINE TEST
— SINCE 1873 —

The R. Thomas and Sons Co.

1873 THOMAS INSULATORS our 78th year RELIABILITY 1951

LISBON, OHIO
NEW YORK CHICAGO

Sales Representatives: E. B. Anderson Co., *Detroit* • Paul Berry, *Oklahoma City* • Ken H. Best, *Seattle* • Butler & Land, *Dallas* • R. E. Cunningham & Son, *Los Angeles* • Electric Supply Co., *Albuquerque* • Engineer Sales Corp., *St. Petersburg* • R. F. Hamilton & Associates, *Denver* • R. H. Harper, *St. Louis* • Geo. E. Henn Company, *San Francisco* • W. J. Hugo, *Minneapolis* • Leiser & Company, *Philadelphia* • Lynn Elliott Company, *Houston* • W. C. Milburn, *Chattanooga* • John G. Pettijohn Company, *Knoxville* • H. E. Ransford Co., *Pittsburgh* • Redmond Supply Co., *Phoenix* • J. F. Schaefer & Co., *Kansas City* • R. J. Sullivan & Company, *Boston* • Walter E. Thompson, *Birmingham* • E. E. Torkell, *Memphis* • Triangle Electric Supply Company, *El Paso* • United Electric Supply Co., *Salt Lake City* • Joe Williams, *Little Rock* • *Representatives in other principal cities*

"...a screw driver for breakfast"

Nine A.M. on a glorious Sunday morning. What a day for the links. John is all set for a quick breakfast — with plenty of crisp golden toast. Suddenly a flash . . . toaster out of commission. John doesn't know it yet, but there goes that golf game. As a good little fixer-upper he's tops in his own mind. But that's not the Mrs.' opinion—nor that of the local service store where tomorrow John will take the "pieces" for a professional repair job. And wait until he discovers that the manufacturer saved a few cents on insulation to meet a price. John won't like it . . . and when he buys a new toaster it will be another make.

Now there is a sleeving that withstands temperatures up to 1200° F., which is unsaturated yet non-fraying.

BH Special Treated Fiberglas Sleeving is a remarkable electrical insulation combining these properties:

Permanently non-raveling—eliminates the extra operation of securing the ends;

Permanently rounded—all corrosive volatile materials are removed and the material is permanently rounded, with crossing strands crimped to provide the non-raveling feature;

Permanently flexible—unaffected by heat or aging.

BH Special Treated is one of a family of BH insulations, each designed to meet particular conditions in service. Whether your problem is heat, cold, flexibility, abrasion, high voltage, or resistance to chemicals, there is a BH insulation to help you. Give us a few facts about your requirements — products, temperatures, voltages. We will furnish production samples for testing.

Address Dept. W-6

Bentley, Harris Manufacturing Co.
Conshohocken, Pa.

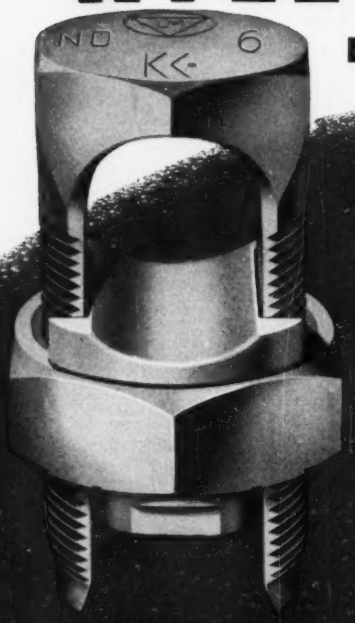
BH Fiberglas* SLEEVINGS

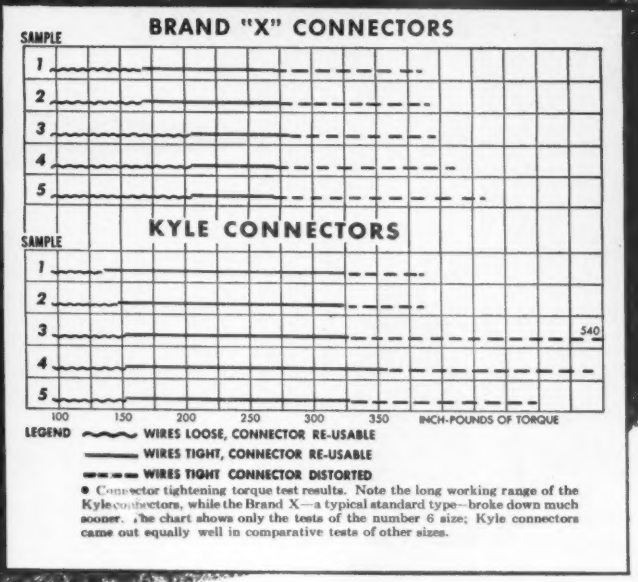
*BH Non-Fraying Fiberglas Sleevings are made by an exclusive Bentley, Harris process (U. S. Pat. No. 2393530). "Fiberglas" is Reg. TM of Owens-Corning Fiberglas Corp.

TORQUE TESTS SHOW

KYLE Split-Bolt Connectors

HAVE A LONGER WORKING RANGE





● Connector tightening torque test results. Note the long working range of the Kyle connectors, while the Brand X—a typical standard type—broke down much sooner. The chart shows only the tests of the number 6 size; Kyle connectors came out equally well in comparative tests of other sizes.

For our own information, we put the squeeze on a bunch of connectors—with a torque wrench. The test chart shows the results.

Note the *long* working range of the KYLE connectors, and the much *shorter* range of Brand X—a typical, standard-quality connector that looks about like ours. That's valuable information for *any* connector purchaser.

HERE'S WHAT HAPPENS . . . *Some* connectors—but not KYLES—have rough threads. That means extra torque to turn the nut, extra strain on the connector body. Often the pad fits badly and goes a little skew-gee, requiring still more torque. Something has to give—the connector body takes the beating.

But heavy-bodied KYLE connectors have clean, accurately machined threads, smoothly rounded edges, a close-fitting pad. The nut tightens easily, the pad slides up smoothly, the force is on the wire—and the connector comes up without damage while still holding the wire much tighter.

COSTS LESS TO USE . . . A connector that can be used only once is an expensive connector. A connector that can be re-used is more economical. KYLE connectors work better, last longer, and, as the chart above shows, they'll stand lots more torque and still come up ready for re-use. That makes it obvious that you get better connections, and lower costs, when you get KYLES, the long-range, long-life connectors.

● If you want to save money with quality connectors, ask the L-M Field Engineer for samples and a copy of Bulletin SC1 which gives details. Or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

TIGHTENING TORQUES FOR SPLIT-BOLT CONNECTORS RECOMMENDED FOR BEST RESULTS

Connector size	Inch-pounds
8	75
6	225
4	275
2	350
2 stranded	400
1/0	500
2/0	600
4/0	750

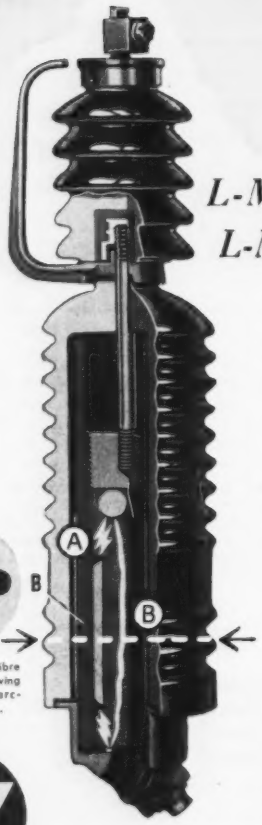
2R

LM

LINE MATERIAL Kyle Connectors

This wedge blows out the arc

How L-M's arc-switching principle makes L-M expulsion arresters LAST LONGER!

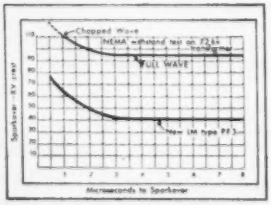


Cross section of fibre arcing plug, showing wedge-shape arc-switching chamber.

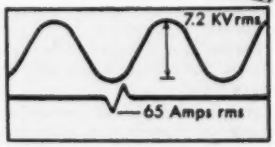
When a surge sparks over in an L-M type PF3 lightning arrester, the arc first jumps the short gaps at *A* (in the cutaway view). Since the arc is in the narrowest part of the wedge-shaped arcing chamber, gas instantly forces the arc over into a long, thin shape at *B*—then blows it out the bottom vent. Fast and sure, it operates in half a cycle or less.

The arc barely touches the electrodes before it's over and out. It doesn't last long enough to burn electrodes or fibre, so the arrester has a long, dependable, trouble-free life.

Better get the whole story from your L-M Field Engineer. Or write for Bulletin LA-3—address Line Material Company, Protective Equipment Division, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).



New lower sparkover level of the 9 kv type PF3 compared with the NEMA minimum standard impulse strength of a 7200 volt transformer. (Other ratings show comparable margins of safety.)



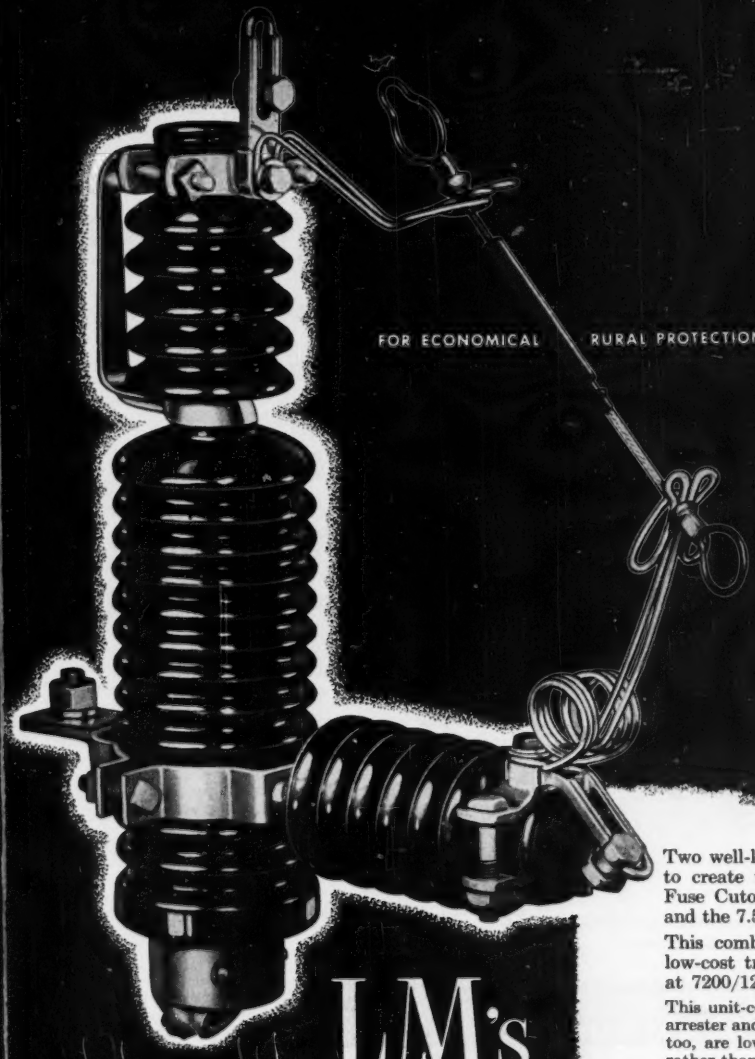
Here a 35000 ampere surge was put on a 7200 volt line with 1200 amp fault current capacity. Because of gas pressure built up by this high surge, the arrester drew only 65 amps follow current, and cut that off in 1/10th cycle. The PF3 also amply meets accepted NEMA standards for lightning arrester performance. Now in seven ratings—3, 6, 9, 10, 12, 15 and 18 kv.

39

LM®

LINE MATERIAL ... Lightning Arresters

Complete Coordinated Equipment for Distribution Today



FOR ECONOMICAL RURAL PROTECTION TODAY

LM's Combination Arrester and Cutout

Saves 20%

Two well-known L-M products have been combined to create the Combination Lightning Arrester and Fuse Cutout—the 9 kv "PF-3" Expulsion Arrester and the 7.5 kv Open-Link "STF" Cutout.

This combination is designed to provide complete low-cost transformer protection on rural lines rated at 7200/12470 and 7620/13200 volts grounded wye.

This unit-combination costs 20% less than the same size arrester and cutout ordered separately. Installation costs, too, are lower, since it is necessary to mount only one, rather than two, units.

The PF-3 arrester has a rated discharge capacity of 65,000 amps, meets all AIEE and NEMA standards. The cutout has a continuous current carrying capacity of 50 amps and 600-amp interrupting capacity. The fusible link is contained in an arc-extinguishing sleeve which confines the arc, assuring successful clearing of a fault. Constant tension on the link assures rapid separation of link parts with no possibility of re-establishing the arc.

Re-fusing is easy and safe. With hot stick in fuse link top loop, the lower end of the link is hooked into the lower contact. The top end of the link is then pulled up and seated in the upper contact.

This combination is REA-accepted.

For details ask the L-M Field Engineer, or write Line Material Company, Milwaukee 1, Wis. (A McGraw Electric Company Division).

LM **LINE MATERIAL... Protective Equipment**

Complete Coordinated Equipment for Distribution Today

7459

PROTECTION TODAY

L-M GROUNDING HARDWARE

adds impulse strength on 34.5—46 kv lines

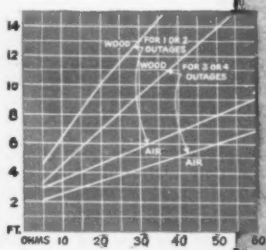
On installations using overhead ground wires, if the grounding down-lead is installed so that it shunts out the wood insulation of the pole, it can reduce or nullify the value of an otherwise good pole-top assembly.

Practical experience has shown the value of getting the down-lead away from the pole. This separation can be made economically with the L-M hardware shown below.

Coordination of wood and air gap dimensions and grounding resistance is the formula.

To simplify the calculation, the estimating chart at the left was developed by Frank E. Sanford as Consulting Engineer for Line Material.

Ask the L-M Field Engineer for a copy of Mr. Sanford's report of a nationwide survey of practices, together with a folder on the transmission hardware items required and a large size copy of the Sanford chart. Or write Line Material Company, Milwaukee 1, Wisconsin (A McGraw Electric Company division).



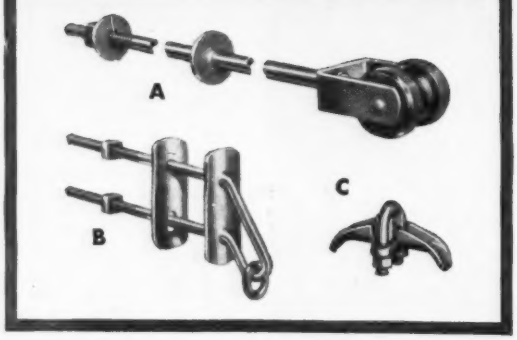
Sanford Estimating Chart for determining minimum air and wood paths for any measured ground resistance. A large size copy is available from L-M.

Don't shunt-out good wood insulation!

Some L-M Grounding Equipment for 34.5—46 kv lines

Here are a few of L-M's many transmission and distribution line construction materials. These are steel, hot-dip galvanized by L-M's modern quality-control methods. All bolts have buffer points to make them easy to drive.

SOME L-M GROUNDING EQUIPMENT FOR 34.5—46 kv LINES



(A) Extended Type Bracket for neutral wire down-lead. Pole-mounted as shown in illustration above. Lengths from 3′2″ to 4′6″.

(B) Loop Bolt for pole top hanging of overhead ground wires. Lengths 11½″ and 13½″ for pole diameters up to 10″.

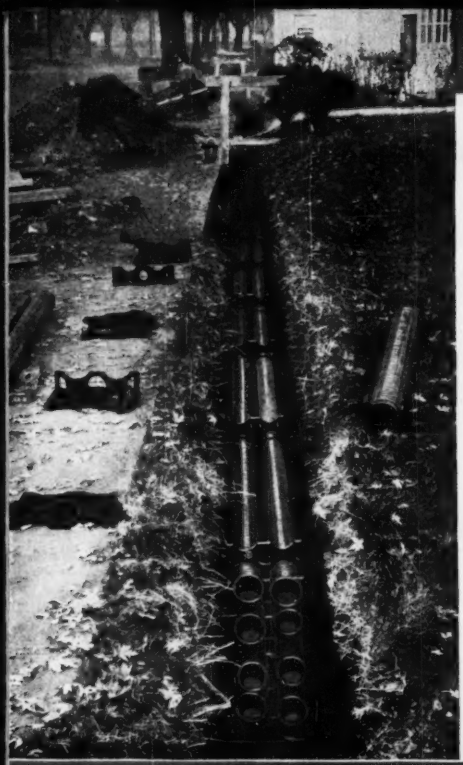
(C) L-M Suspension Clamp. Forged steel, heavily galvanized. Hangs from the Loop Bolt to hold the overhead ground wire.

7759

LINE MATERIAL

Line Construction Materials

Complete Coordinated Equipment for Distribution Today



for faster underground installations

New L-M Spacers

New L-M Base Spacer:

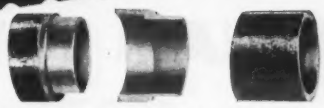
assures rigid foundation, desired gradient. Interlocking ends; wide flat base—the spacer will not tip over during or after installation. All L-M spacers come in standardized cartons to save stockroom handling and space. Available from stock, in six standard sizes.

New L-M Intermediate Spacer:

made of asphalt and asbestos fibre, highly resistant to acids and alkalis, fire resistant, Underwriters' listed. Withstands vertical flat crushing test of over 1200 pounds. Grooved ends lock together with the next spacer; centers notched for sawing.

New L-M Bend Spacer Bar:

a duct-installation leveller, used horizontally or vertically for accurate alignment of conduit around bends. Saves hours of work in lining up. Offers a tremendous saving in installation labor costs. L-M exclusive. 20" long, 1¼" square, easily sawed to length.



New L-M Multi-Use Bend Sections and Angle Couplings:

use in any combination to make all kinds of special bends and crossovers. Male and female tapers offset 2½°, giving 5° bend in each section. Smooth inside, watertight tap-tite joints.

The L-M System makes Fibre Conduit *so easy to use*

New L-M Fibre Conduit Vise

An easy, safe way to hold fibre conduit for sawing or tapering. For mounting on truck or bench, or with detachable tripod for use in the field, on the job.

With L-M Fibre Conduit and L-M equipment and tools, L-M's system speeds up underground installations, makes better jobs.

L-M Fibre Conduit is strong, light, tough; yet it's easy to taper and cut to length. L-M base spacers, intermediate spacers, and bend spacers assure a firm foundation and a rigid structure that won't settle or shift.

L-M tools save hours of time in the shop and on the job. Better get the low-down on this high-class, time-saving equipment.

GET THIS FREE HANDBOOK! Pocket-size manual covers recommended underground construction practices; contains valuable reference tables. Ask the L-M Field Engineer for a copy, also for new Fibre Conduit folder; or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

New L-M Tapering Tool

Cuts a precise 2° taper on the end of conduit to assure tight, snug joints. Light; easy to use; saves time; cuts costs by salvaging cut ends and short lengths quickly.

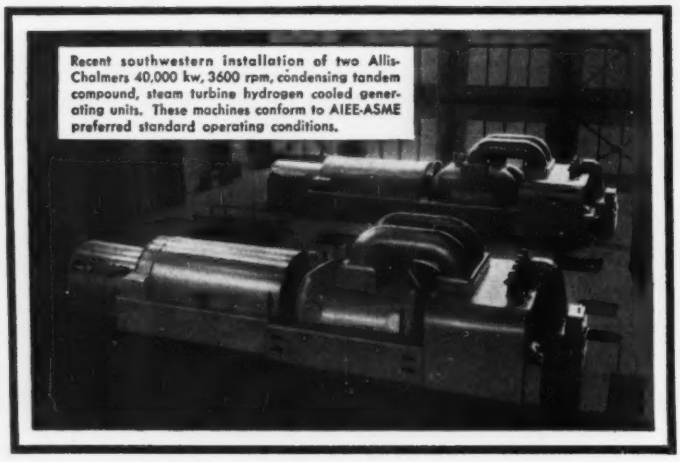
36

LINE MATERIAL ... Fibre Conduit

Complete Coordinated Equipment for Distribution Today

Vital Aluminum Production Aided by

STEAM TURBINE GENERATORS!



Recent southwestern installation of two Allis-Chalmers 40,000 kw, 3600 rpm, condensing tandem compound, steam turbine hydrogen cooled generating units. These machines conform to AIEE-ASME preferred standard operating conditions.

POWER IS PRIMARY in producing aluminum. It is used directly, and in large amounts, for the electrolytic reduction of alumina.

Major U. S. deposit of bauxite ore producing the critically needed aluminum is in Arkansas. All of which adds to the importance of the above new steam turbine generator units at the Lake Catherine steam-electric station of the Arkansas Power & Light Co.

Installed in 1950, these two 40,000 kw hydrogen cooled units generate all the power produced at the Lake Catherine plant. They run 24 hours a day, with the majority of their power being used in aluminum production.

Like all Allis-Chalmers steam turbine generators, these units are built to high economy, high quality standards. One example is labyrinth steam seal glands, obtaining their steam supply in part from the leak-offs of control valve stem packing.

Steam seals only are used in the entire line of Allis-Chalmers steam turbine generator units, ranging from the smallest single cylinder machines to the largest cross-compound types. Their inherent freedom from operating hazards increases reliability. This is one of the many ways Allis-Chalmers simplifies turbine operation.

When you plan the installation or expansion of a steam-electric power plant, put *80 years* of steam power experience to work for you. For specific information on a *complete* line of electric power equipment, call your nearest A-C office or write to Allis-Chalmers, Milwaukee 1, Wis. A-3217

ALLIS-CHALMERS

TURBINES & GENERATORS | CONDENSERS & PUMPS | SWITCHGEAR & BREAKERS | MOTORS & CONTROL | TRANSFORMERS | WATER CONDITIONING

World's Widest Range of Power Plant Equipment

MAKE A *Good Connection!*

WEAVER

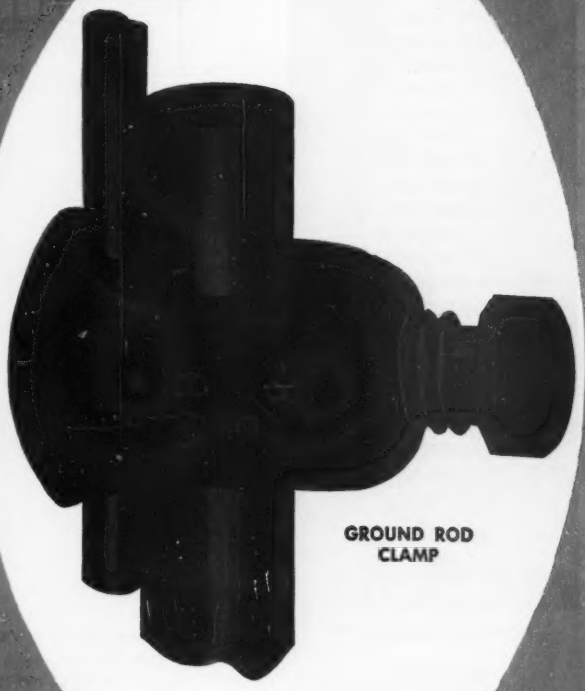
CAST GROUND ROD CLAMPS

CAST of high strength Aluminum Bronze, WEAVER GROUND ROD CLAMPS withstand great tightening torques without distortion and assure permanent high pressure connections.

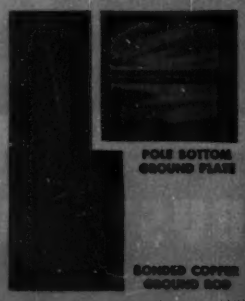
They are designed to assure perfect alignment between rod and wire, and the long wire-bearing surface provides exceptionally good contact.

Clamps are provided with either hex head or socket set screws which are specially machined with rounded points to prevent damaging the surface of the Ground Rod.

For top quality at lowest cost, you can't beat WEAVER CAST GROUND ROD CLAMPS.



GROUND ROD CLAMP



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NEW UTILITY STATIONS C-E EQUIPPED

Includes stations placed in operation since the war (in white) and those under construction or being engineered.

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POSSUM POINT
PORT JEFFERSON
CUTLER
WHITE RIVER
GADSDEN
POTOMAC RIVER
W. SPRINGFIELD
WOOD RIVER
LAKE CATHERINE
HARRY NEWMAN
DAN RIVER
JIM HILL
HUTCHINSON
YATES
DUNKIRK
TITUS
LEE

CONTRA COSTA

HAWTHORN
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BLACK DOG
ALBANY
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HENNEPIN
EAST LAKE
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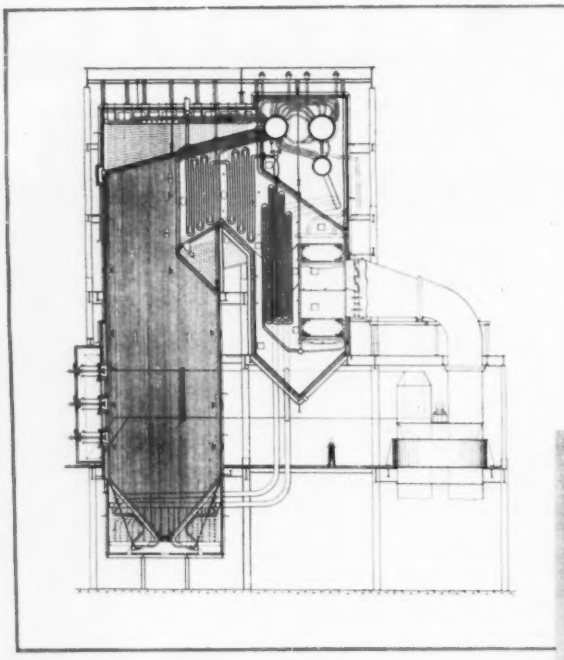
AURORA

NEW



The cross-sectional view above shows one of the C-E Units that recently went into service at the Contra Costa Steam Plant. These units are of the radiant type with 3-stage superheaters and have finned tube economizers in the last pass. Regenerative type air heater follows the economizer surface. Initially the units will be fired with oil or gas but provision is made for the future use of pulverized coal if desired.

C-E

COMBUSTION

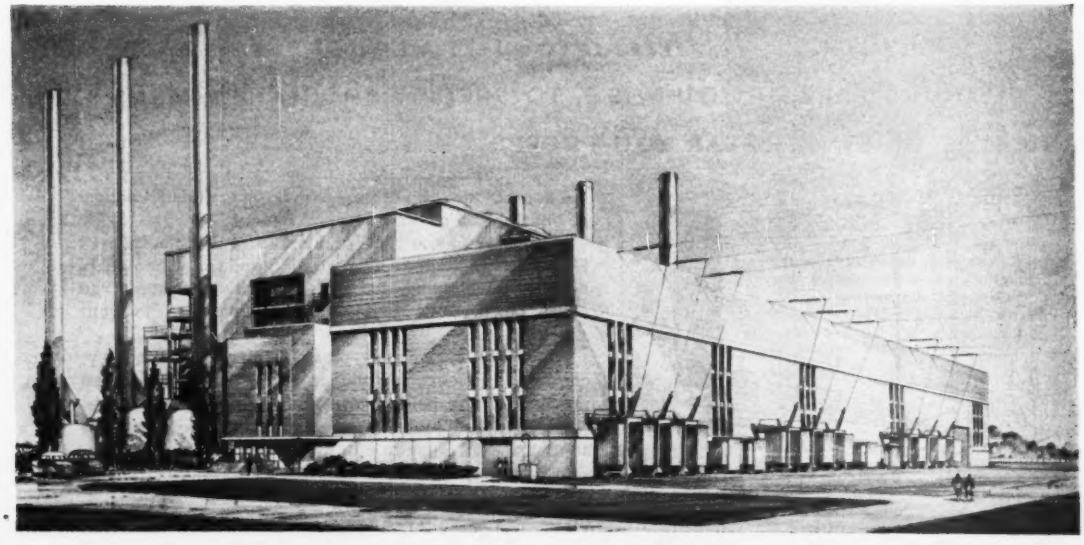
200 MADISON AVENUE, NEW YORK 16, N. Y.

CONTRA COSTA PLANT GOES INTO SERVICE

The new Contra Costa Steam Plant of the Pacific Gas and Electric Company was recently placed in service when the first of three 100,000 kw turbine generators went on the line. It is expected that the second and third units will be in service this summer.

This large, modern station, designed and constructed by Bechtel Corporation under the general supervision of the Engineering Department of the Pacific Gas and Electric Company, is located near Antioch, Contra Costa County, California on the San Joaquin River. Its power will be transmitted at 220 kv to the area contiguous to San Francisco and to other parts of the system. The completion of this plant brings the post war expansion program of the Pacific Gas and Electric Company to a total of 1,370,000 kw of new generating capacity.

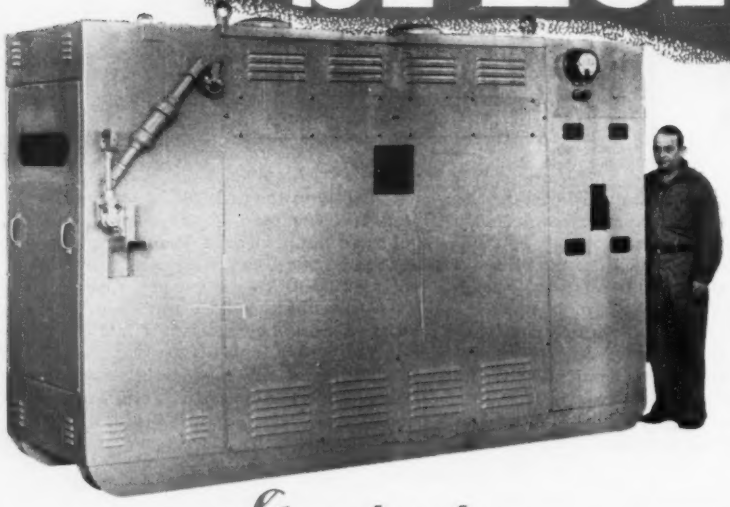
Steam for the three units will be supplied by six C-E Steam Generating Units each designed to supply 550,000 lb of steam per hr at 1405 psi and 950F at the superheater outlet. A cross-sectional elevation and brief description of the steam generating units for this station is given on the opposite page. B-483



ENGINEERING—SUPERHEATER, INC.

ALL TYPES OF BOILERS, FURNACES, PULVERIZED FUEL SYSTEMS AND STOKERS; ALSO SUPERHEATERS, ECONOMIZERS AND AIR HEATERS

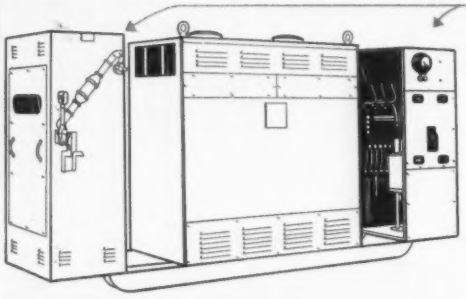
SPECIFY



Indoor unit substation including: High-voltage Disconnect Switch and Fuses, Air Cooled 1000 KVA STANDARD Transformer and Low-Voltage Circuit Breaker Cubicle with Metering. H-beam base permits portability. Suitable for platform mounting indoors.

WITH *Standard* BUILT UNIT SUBSTATIONS

YOU'RE FREE, IF YOU WISH, TO SPECIFY THE MAKE AND TYPE OF SWITCHGEAR YOU PREFER



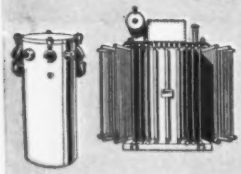
STANDARD builds transformers only . . . the heart of the load center. You have complete freedom in your choice of accessory equipment.

You specify the type and make of Switchgear and Cubicles which you prefer, and Standard will quickly produce a well-integrated unit — exactly designed to the proper dimensions and arranged according to your requirements.

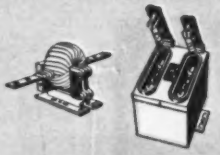
Standard assemblies provide maximum economy, combining lowest installation costs with the safest practices in the field of transformer application.

Special requirements are produced as quickly as standard jobs.

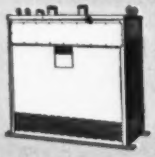
TRANSFORMERS FOR EVERY APPLICATION



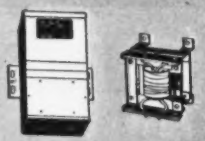
Liquid filled (sizes up to 10,000 KVA and 72 KV inc.)



Instrument transformers (for use on circuits up to 72,000 volts, inc.)



Dry type (up to 1000 KVA and max. voltage ratings of 4800)

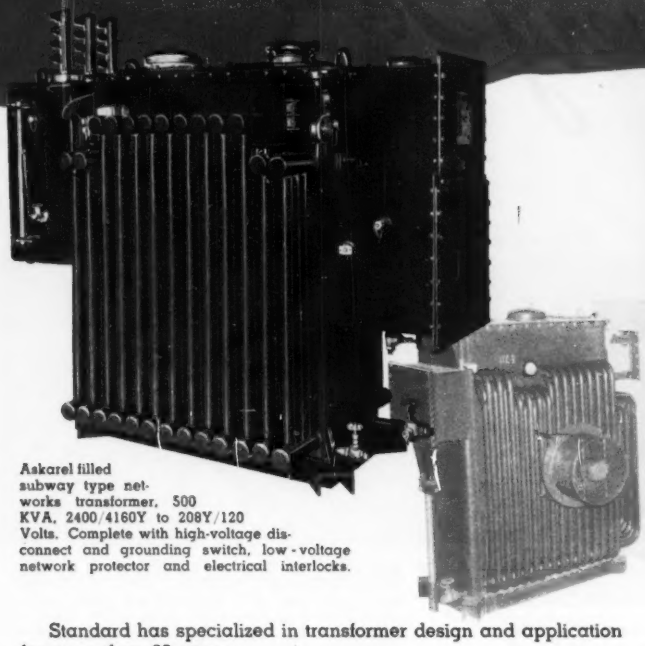


Control transformers (compound filled or open type)

Standard
TRADE MARK ®

AIR, OIL OR ASKAREL COOLED

· LOAD CENTERS · UNIT SUBSTATIONS



Askarel filled subway type networks transformer, 500 KVA, 2400/4160Y to 208Y/120 Volts. Complete with high-voltage disconnect and grounding switch, low-voltage network protector and electrical interlocks.

Load center unit substation, 300 KVA Askarel filled transformer, equipped with high-voltage disconnect switch, pothead, key interlock and low-voltage cubicle containing secondary circuit breakers. Suitable for either indoor or outdoor installation.

Standard has specialized in transformer design and application for more than 30 years.

Every load center substation is custom-built to fit a specific need.

Whether unit substations are required for indoor, outdoor or underground installation, STANDARD can meet your most exacting requirements and include accessory equipment made by your preferred supplier. Write today for specific information.

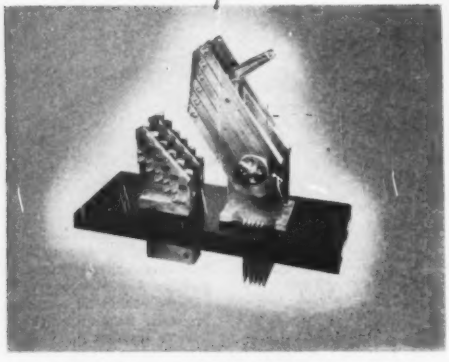
SEE YOUR NEARBY Standard REPRESENTATIVE FOR ALL YOUR TRANSFORMER NEEDS

THE STANDARD TRANSFORMER COMPANY

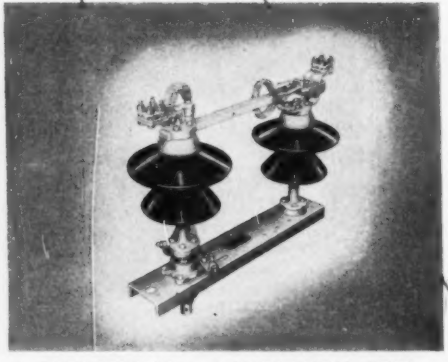
WARREN, OHIO • REPRESENTATIVES IN PRINCIPAL CITIES

6 BASIC DESIGNS
15 Applications

Cover Every Switching Job



1. BASIC DESIGN Type HPS DISCONNECT SWITCH. a, Indoor; b, Outdoor. Available up to 69 KV, all capacities. Vertical or inverted mountings.



2. BASIC DESIGN Type A HORIZONTAL OPENING DISCONNECT SWITCH. (Type A) Single Break and (Type AT) Double Break Disconnects; (Type AA) Single Break and (Type ATA) Double Break Horn-Gap Switches. All types rated to 161 KV. Disconnects - all mountings; Horn-Gap Switches —upright mounting only.

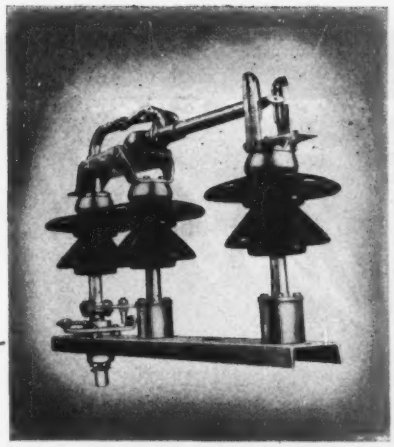
HIGH-PRESSURE CONTACTS

Characterize all R&IE Switching Equipment

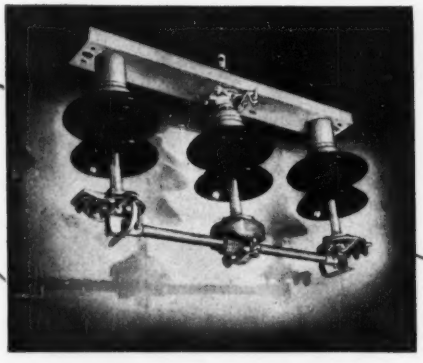
and is an original R&IE development which has become the standard of the industry.

Check the facts ... **on the new Hi-Thermal Capacity Jaws, Sealed Pressure Hinge Contacts, Reversible (Type A) Blades, plus - other R&IE firsts such as Universal Terminal Clamps with 4 half-inch bolts, Greaseless Bearings, Spot Pressure Contacts, all Non-Ferrous Parts above insulators, Rigid Channel Bases, and adequate clearance between movable parts.**

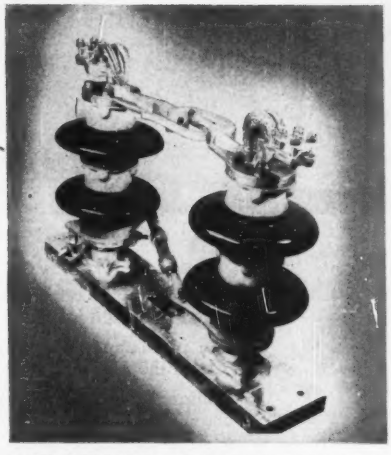
Problem



4. BASIC DESIGN Type TTR VERTICAL OPENING DISCONNECT SWITCH. (Type TTR-49) Disconnect; (Type TTRA-49) Horn-Gap—short horn; (Type TTRL-49) Horn-Gap—long horn. All types rated to 230 KV. Disconnects—all mountings; Horn-Gap-upright only (also vertical mounting with short tips).



3. BASIC DESIGN Type TT HORIZONTAL BREAK DISCONNECT SWITCH. (Type TTT) Double Break; (Type TTS) Single Break. All types rated from 34.5 to 196 KV. Upright and inverted mountings.



6. BASIC DESIGN Type DR CENTER BREAK DISCONNECT SWITCH. (Type DR) Disconnect; (Type DRA) Horn Gap. Disconnects rated to 161 KV; Horn-Gaps rated to 69 KV. Disconnects—all mountings; Horn-Gaps, upright mounting only.

5. BASIC DESIGN Type RT VERTICAL BREAK DISCONNECT and HORN GAP SWITCH. (Type R2T) Two Insulator; (Type R3T) Three Insulator. All types rated to 34.5 KV. Upright and vertical mountings.

R&IE

Where could you get more?

RAILWAY and INDUSTRIAL ENGINEERING CO., Greensburg, Pa.

IN CANADA—EASTERN POWER DEVICES LIMITED, TORONTO

AN I-T-E SUBSIDIARY

The Check List

CONDUCTOR SUPPORTS, CLAMPS AND FITTINGS

DISCONNECTING SWITCHES
INDOOR AND OUTDOOR

HORN GAP SWITCHES

INTERRUPTER SWITCHES

CUTOUTS AND THERMO-RUPTERS

DISTRIBUTION EQUIPMENT

SWITCH OPERATING MECHANISMS

SUBSTATIONS

OPEN OR ENCLOSED, ISOLATED PHASE HEAVY DUTY BUSES

KIRK INTERLOCK SYSTEMS

AUTOMATIC SWITCHING EQUIPMENT

METAL CUBICLES

TESTING DEVICES

Designed and Built by The Kuljian Corporation

THIS beautiful building houses one of the largest power plants ever designed and built for the Far East.

During preliminary negotiations, The Kuljian Corporation offered the Client the following choices:

1. Kuljian services to engineer and design the project, including engineering supervision of the Client's contractors.
2. Kuljian construction forces to build the plant including initial operation—if engineering is awarded to others or done by Client's own staff.
3. Kuljian organization to design and build the plant complete from original survey to and including initial operation—on a one-contract, one-responsibility basis. This was the method selected.

Whichever plan you decide upon, The Kuljian Corporation, with all its facilities and vast experience in the fields of engineering and construction, and with a magnificent record behind it, stands ready to serve you.

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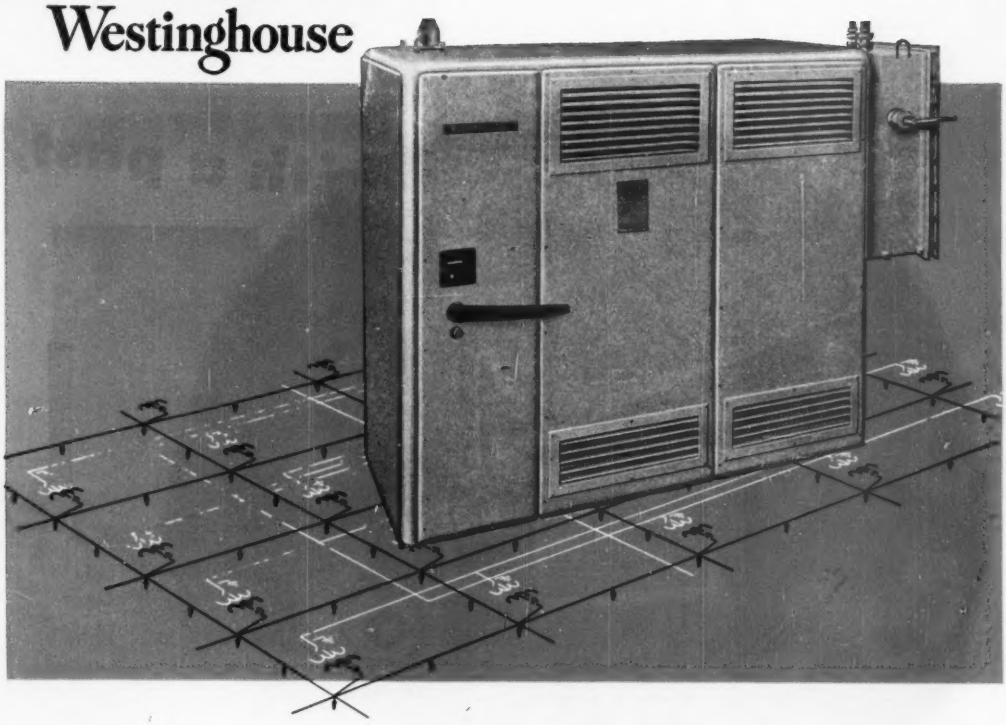
Westinghouse



IDEAL . . . for Indoor Network Service

Safe and clean, the Westinghouse Ventilated Dry-Type "ASL" Transformer approaches perfection for indoor network service. Air-cooled, it has no liquids to filter or maintain. It is the most economical indoor transformer to install, because it meets Underwriters' code requirements without a vault.

No matter what type of network system you plan, or what your installation problems may be, Westinghouse can help you keep costs down . . . now . . . and in the future.

HERE'S WHY:

Now—There is a Westinghouse Network Transformer specifically designed to answer each of your network problems. In addition to "ASL" VENTILATED DRY-TYPES, there are SEALED DRY-TYPES, the safest transformers ever built; LIQUID-FILLED (oil or Inerteen®), most economical for general use; and TYPE "S", pole-mounted to bring network advantages to less dense areas. Standardized construction provides lower initial cost and lower installed cost, too. Special hook-up problems are eliminated.

And in the Future—Years of leadership in the design and construction of network transformers show in the high quality and maintenance-free operation of Westinghouse Transformers. In addition, our complete facilities . . . engineers and calculating boards . . . are available to help you with your network planning, to make future expansion more economical.

Ask your Westinghouse representative for further information, or write for Booklets B-4028 and B-4002-A. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70560

Westinghouse

NETWORK TRANSFORMERS

vision — with a past,

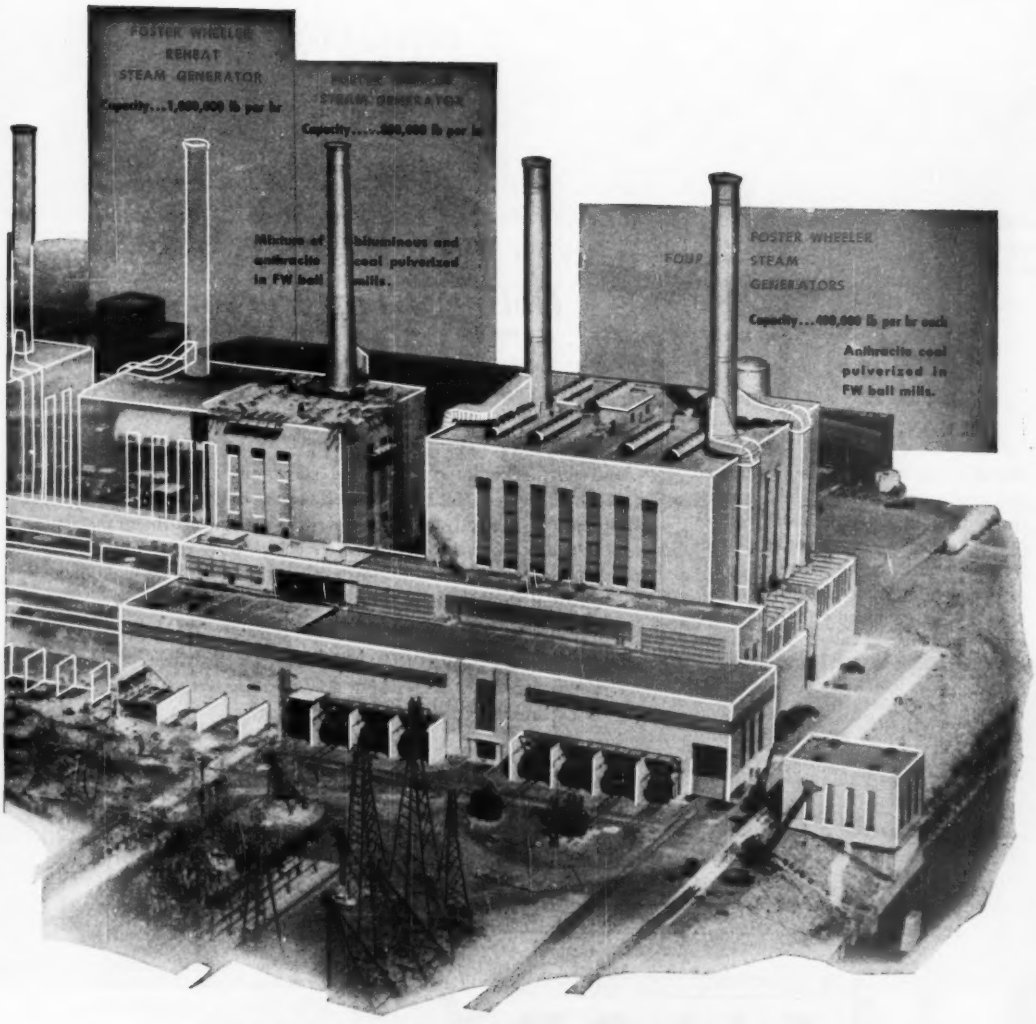
The original Sunbury Steam-Electric Station which was built by Thomas A. Edison in 1883.

The vision began to take form on Independence Day, July 4, 1883 at Sunbury, Pa. when Thomas A. Edison threw the switch of the first commercial steam-electric station in the world. This was one of the epochal events foreshadowing the scientific, industrial, and economic miracles of the 20th century. The new Sunbury Steam-Electric Station near Sunbury, Pa. reflects both the tradition of our American past and the hope of tomorrow as its fine buildings emerge from the blueprint stage to provide an abundant source of power for factories, offices, farms, and homes in Central Eastern Pennsylvania.

The earliest section which houses four Foster Wheeler 400,000 lb per hr steam generators providing steam for two 75,000 kw turbine generators is the world's largest power plant burning pulverized anthracite. The first extension houses a 100,000 kw turbine generator and an 800,000 lb per hr Foster Wheeler steam generator. Engineering is under way for the installation of an additional Foster Wheeler 1,000,000 lb per hr reheat steam generator designed to serve a 125,000 kw unit. When ultimately completed, the station is expected to have a capacity of more than 700,000 kw.

FOSTER WHEELER CORPORATION • 165 BROADWAY, NEW

present, and future



YORK 6, N. Y.

FOSTER WHEELER

Value Beyond Specification!

ELKONITE*

has no "equivalent"

. . . *only* Mallory Elkonite *Delivers Top Performance*

Many years of pioneering in powder metallurgy of incompatible metals enabled Mallory to originate the Elkonite group of contact materials developed specifically for circuit breakers and other heavy duty electrical equipment.

Today, Elkonite continues to stand out among all powder metallurgy contact materials...by virtue of a superiority which stems not only from the properties of the constituent metals ***but also from the technique by which they are combined.*** Mallory engineers have so developed this art that no other material can equal Elkonite in conductivity, impact strength, hardness, AR** factor, and heat resistance.

Only by specifying true Elkonite, are you assured of top performance . . . the result of precision compounding and years of experience with powder metallurgy for contact applications.

That's value beyond specification!

Mallory contact know-how is at your disposal. What Mallory has done for others can be done for you.

In Canada, made and sold by Johnson Matthey & Mallory, Ltd., 110 Industry St., Toronto 15, Ontario

ELKONITE CONTACTS

Elkonite contacts are made by a unique and time-proved method which permits the combining of the desirable features of basic metals which cannot be alloyed. By this means, the high melting points of tungsten, molybdenum, or their carbides, can be combined with the current-carrying ability of silver and copper. Elkonite materials are best known for their hardness, resistance to mechanical wear and impact, resistance to erosion by arcing (AR factor), and resistance to sticking.

**Reg. U.S. Pat. Off.*
***The ability of a contact material to withstand the erosion of an electric arc.*

Electrical Contacts and Contact Assemblies

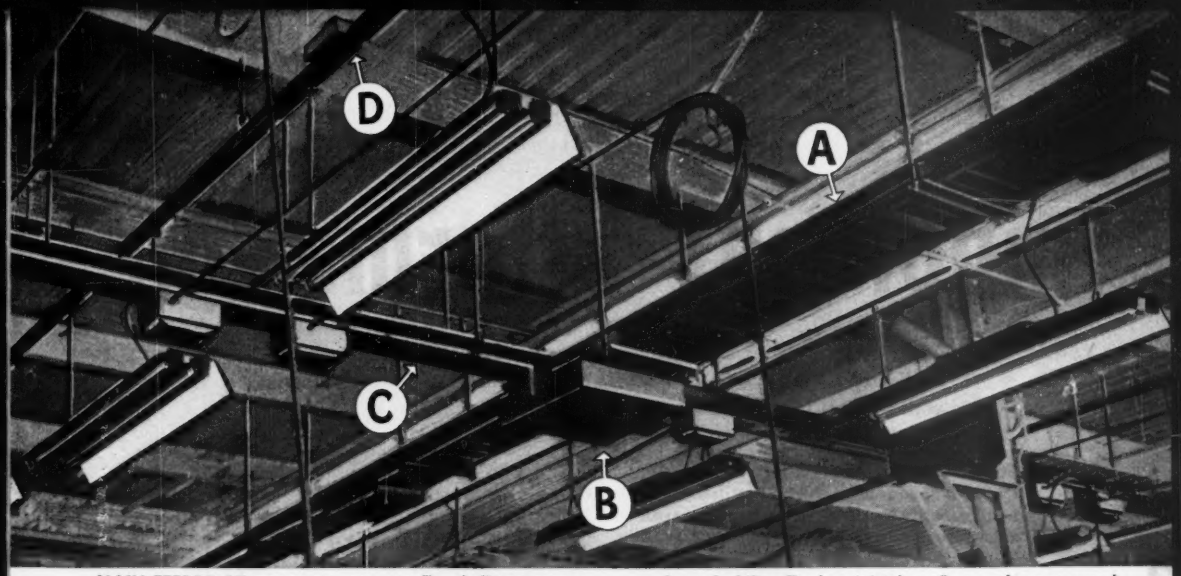
P. R. MALLORY & CO. Inc.
MALLORY
P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

SERVING INDUSTRY WITH

Electromechanical Products
Resistors *Switches*
TV Tuners *Vibrators*

Electrochemical Products
Capacitors *Rectifiers*
Mercury Dry Batteries

Metallurgical Products
Contacts *Special Metals*
Welding Materials



MAIN FEEDER AT SEALED POWER CORP. Trumbull LVD FLEX-A-POWER high-capacity feeder (A) distributes power through plant with minimum voltage loss. Can be dismantled, relocated with complete salvability. Tap box (B) takes off power for FVK secondary feeders (C). 600-4000 amperes. LTG (D)—see below—is used for lighting. Bulletin TEB-1.

SECTIONALIZED POWER FEED

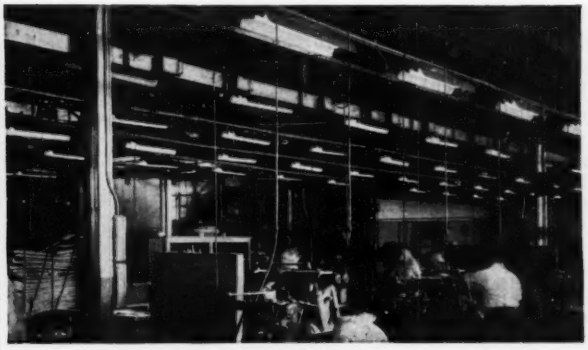
is ready for quick conversion

No plant... few buildings... can foretell what its power requirements will be months—or days—ahead.

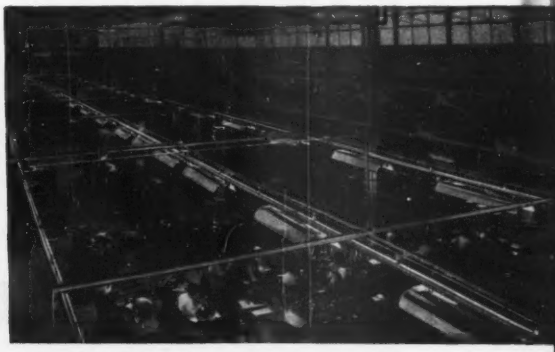
But with FLEX-A-POWER® handling the electric power distribution from main switch or breaker to machine or lamp... any new requirement, additional load or rearrangement of load, can be easily met.

This system of standard-section busways gives utmost flexibility in power take-off, and, if necessary, can be taken apart for quick relocation. Easier to install than wiring and conduit—and more economical—it is ideal for a period when emergencies may develop, when conversion may be necessary.

Write us for literature on the types that interest you.



SECONDARY FEEDER AT PESCO PRODUCTS Division of BORG-WARNER CORP. Nearly ¾-mile of 600 amperes, 440 volt Trumbull FVK FLEX-A-POWER takes power from a panelboard in parallel runs over entire area. 15 outlets to each 10-ft. section. No expensive rewiring needed when relocating loads. Can also be easily dismantled and re-installed. 225-1000 amperes. Bulletin TEB-4.



LIGHT-DUTY BUSWAY AT PESCO PRODUCTS Division of BORG-WARNER CORP. Use of LTG FLEX-A-POWER to distribute power to tools and lighting fixtures permits quick changes in machine layout without delay for rewiring. Busway can be tapped *at any point* by plug or trolley—every inch an outlet. Rated 50 amperes. Bulletin TEB-2.

TRUMBULL ELECTRIC

Plainville, Conn.

Important Information

IF you are a producer of products using steel, aluminum or copper, it is vitally important that you know what Controlled Materials Plan forms apply to your industry and how you may obtain them. We think the information on the three basic CMP forms listed below will be helpful.

FORM CMP-4A: For any producer of Class A products who is requested to apply for an authorized production schedule and related allotment by a Claimant Agency or consumer for whom he produces Class A products.

FORM CMP-4B: For any producer of Class B products who is requested by NPA to file an application with the appropriate Industry Division for an authorized production schedule and related allotment.

FORM CMP-4C: For any person requiring an allotment for controlled materials for use in construction.

Further information on Class A and Class B products, as well as applications for CMP authorizations and allotments on these three forms, are available at your local National Production Authority field office or their headquarters in Washington.

We also direct your attention:

TO CMP REGULATION NO. 4 which sets forth the rules under which distributors such as ourselves may make deliveries of controlled materials to their customers.

IT IS IMPORTANT for you to know that whenever you place an ***authorized controlled material order*** with a distributor either orally or by telephone, it must be followed by a written confirmation within 15 days. If a customer fails to comply with this provision, a distributor is required to report the delinquency to the National Production Authority.

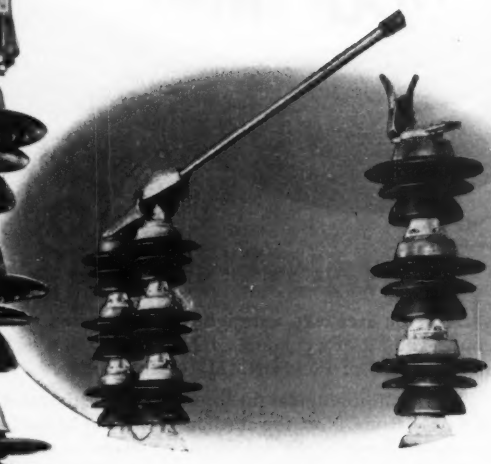
WE THEREFORE URGENTLY REQUEST that directly after placing an authorized controlled material order either orally or by telephone with your distributor, you immediately send him a written confirmation. By doing this you will protect yourself and help your distributor and the National Production Authority keep CMP working smoothly.

UNITED STATES STEEL SUPPLY COMPANY

Warehouses and Sales Offices: BALTIMORE · BOSTON · CHICAGO · CLEVELAND · LOS ANGELES · MILWAUKEE · MOLINE, ILL. NEWARK · PITTSBURGH · PORTLAND, ORE. · SAN FRANCISCO · SEATTLE · ST. LOUIS · TWIN CITY (ST. PAUL)
Sales Offices: INDIANAPOLIS · KANSAS CITY, MO. · PHILADELPHIA · ROCKFORD, ILL. · TOLEDO · TULSA · YOUNGSTOWN

Headquarters Offices: 208 S. La Salle St.—Chicago 4, Ill.

UNITED STATES STEEL



Now... *Main Switch Design Features* in an improved grounding blade!

Here's the unit that answers your demand for a grounding device that matches main switch performance. For high-voltage switches (above 69 kv) this improved grounding blade incorporates these proved Type V switch features:

1. **Shuntless construction . . . there's nothing to corrode or break.**
2. **Completely enclosed, hinged-end operating arm.**
3. **High-pressure line contacts throughout.**
4. **A minimum of moving parts.**
5. **Oilite bushings for permanent lubrication.**

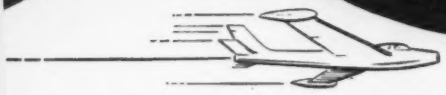
For complete information write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna. J-60752

Five important Type V switch features are incorporated in this improved grounding blade.

See "Electrical Proving Ground"... the dramatic story of the Westinghouse High Power Laboratory in sound and color motion picture. For details see your Westinghouse representative, or write Westinghouse, Film Division, Box 868, Pittsburgh 30, Pennsylvania

YOU CAN BE SURE.. IF IT'S
Westinghouse
DISCONNECTING SWITCHES

"Preformed" MEANS MORE



Did you ever take a straight piece of spring wire and attempt to wrap it uniformly around a rod . . . or a conductor? Try it. You will then begin to appreciate a few of the outstanding merits of PREFORMED Armor Rods.

The photograph at the top of this advertisement shows Aluminum Alloy PREFORMED Armor Rods. Note the absolute *uniformity* of the helices. The pitch of each helix is 9 times the diameter of the conductor or strand to which it will be applied. The inside diameter of each helix is 85% of the conductor diameter.

Such exact PREFORMING can be done only in the Factory by precision tools and methods. It is impossible to attain such perfection in the Field with any hand tools or practices.

Every PREFORMED Armor Rod is exactly like all others of the same size. On the display truck (below left) are 34,000 PLP Rods for No. 4 ACSR. They are sufficient to armor 226 miles of conductor . . . single-phase, light loading. ALL RODS ON THE TRUCK ARE IDENTICAL.

Such UNIFORMITY is of extraordinary value TODAY in view of the manpower demand and the scarcity of aluminum and copper.

Preformed Armor Rods *SAVE MAN-HOURS* because linemen can install them in just a fraction of the time required for any other accepted method . . . and do a better job. No tools of any kind are required for the majority of installations. Clamps, time-consuming bolts and nuts are not needed.

Preformed Armor Rods *SAVE CRITICAL MATERIAL* because they make possible (1) the repairing and rebuilding of transmission lines, (2) the rehabilitation of old conductors, (3) the increase in current-capacity of existing lines and (4) the lengthening of the life expectancy of present and future lines.

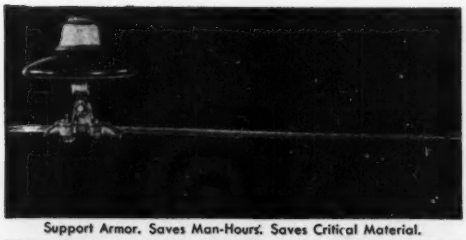
★EACH POUND OF PREFORMED ARMOR RODS USED MAKES POSSIBLE A POTENTIAL SAVING OF 7/10 POUNDS OF CRITICAL ALUMINUM. WRITE ON YOUR LETTERHEAD FOR COMPLETE DETAILS.

PLP

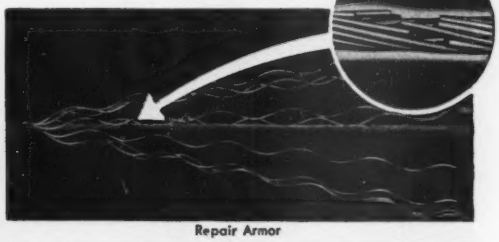
TODAY THAN EVER BEFORE...

Get the most from Preformed Armor Rods

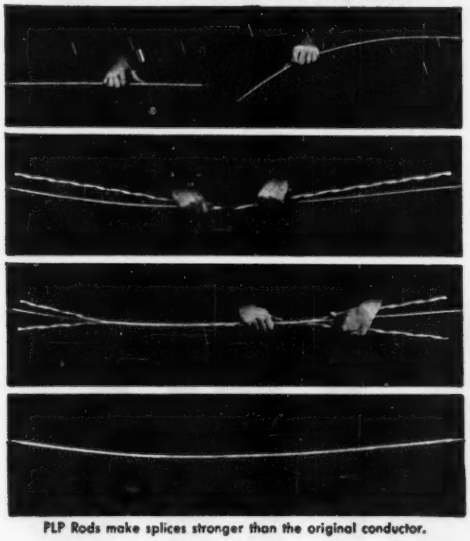
These revolutionary new rods are not just for the armoring of transmission conductors at support points. Utilities throughout the Country are using them for many other jobs. Here are just a few examples:



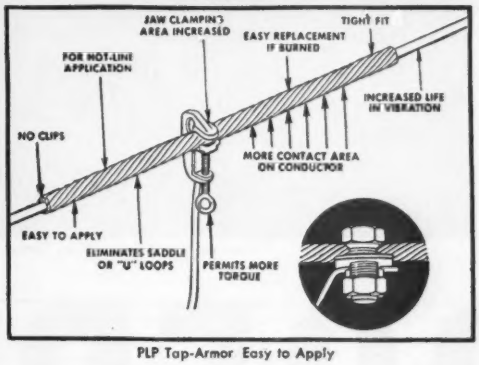
Support Armor. Saves Man-Hours. Saves Critical Material.



Repair Armor



PLP Rods make splices stronger than the original conductor.



PLP Tap-Armor Easy to Apply

also.. Preformed Jumpers, Strand Armor, Dead-Ends for Guys and Conductors, Tie Wire, Dual-Conductor Spacers, Lashing Armor, Dampers and Suspension Clamp Jumpers.

PREFORMED LINE PRODUCTS CO.

5349 ST. CLAIR AVENUE CLEVELAND 3, OHIO

PARKWAY CABLE

Photo courtesy of Barber-Greene Company

For economical, direct-in-the-ground burial

YOU'LL CUT EXPENSE to the minimum by adopting Roebling Parkway Cable for distribution and general power supply circuits. This cable is buried directly in a shallow, economical trench... and assures you dependable, maintenance-free service year in, year out.

Roebling Parkway Cable is made in single and multiple conductor – solid or stranded – in a range from 600 to 5,000 volts. Furnished with metallic armor or non-metallic ROEPRENE sheath, depending upon the amount of physical protection required.

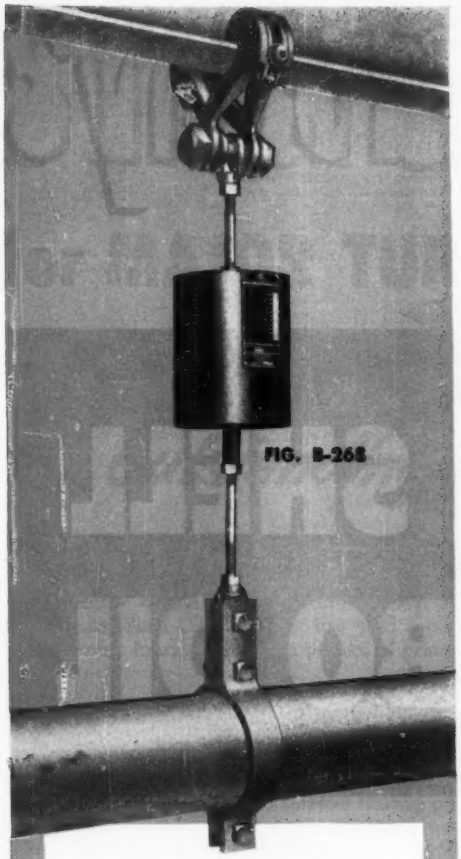
C. A. A. Approved for Airport Lighting

Roebling Type A cable for 600 volts, and Type B for 3,000 and 5,000 volts, pass all C.A.A. requirements for Specification No. L-824. Both types are made in single and multiple conductor construction. Type A has RP insulation; the insulation of Type B is ozone-resistant oil-base rubber.

Large quantities of Roebling's full line of electrical wires and cables are called for in the national rearmament program. The Roebling organization and distributors will always, however, give you the best service and deliveries within their power. John A. Roebling's Sons Company, Trenton 2, New Jersey.

ROEBLING

Atlanta, 934 Avon Ave ★ ***Boston,*** 51 Sleeper St ★ ***Chicago,*** 5525 W. Roosevelt Rd ★ ***Cincinnati,*** 3253 Fredonia Ave ★ ***Cleveland,*** 701 St. Clair Ave, N.E. ★ ***Denver,*** 4801 Jackson St ★ ***Detroit,*** 915 Fisher Building ★ ***Houston,*** 6216 Navigation Blvd ★ ***Los Angeles,*** 216 S. Alameda St ★ ***New York,*** 19 Rector St ★ ***Odessa, Texas,*** 1920 E. 2nd St ★ ***Philadelphia,*** 230 Vine St ★ ***San Francisco,*** 1740 17th St ★ ***Seattle,*** 900 1st Ave, S. ★ ***Tulsa,*** 321 N. Cheyenne St ★ Export Sales Office, ***Trenton, N. J.***



Pre-solve Pipe Suspension Problems...

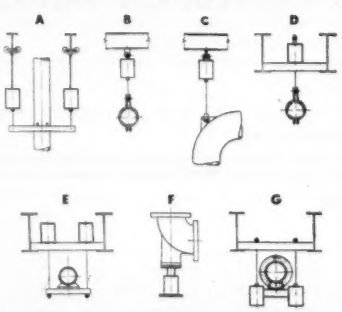
with

Grinnell Pre-engineered Spring Hangers

- Maximum variation in supporting force per ½" of deflection is 10½% of rated capacity — in all sizes.
- Precompression* assures operation of spring within its proper working range where variation in supporting force is at a minimum.
- Compact—minimum headroom made possible by precompression*.
- Guides prevent contact of coils with casing wall or hanger rod and assure continuous alignment and concentric loading of spring.
- All-steel welded construction meets pressure piping code.
- 16 sizes available from stock — load range from 74 lbs. to 9000 lbs.
- Easy selection of proper sizes from simple capacity table.
- Installation is simplified by integral load scale and travel indicators.
- Unique swivel coupling provides adjustment and eliminates turnbuckle.

**Precompression is a patented feature.*

TYPICAL APPLICATIONS

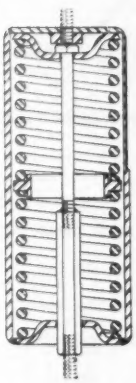


(A) Rod threaded to top cap (B) Furnished with single lug (C) Two lug style (D) Top adjusting (E) Adjustable top and bottom (F) For floor support (G) Trapeze assembly.

FOR LESS VARIATION IN SUPPORTING FORCE — FIG. 98

Fig. 98 is an adaptation of Grinnell's popular spring hanger, Fig. 268. It consists of two springs arranged in series within a single casing. A centering guide insures the permanent alignment of the spring assembly.

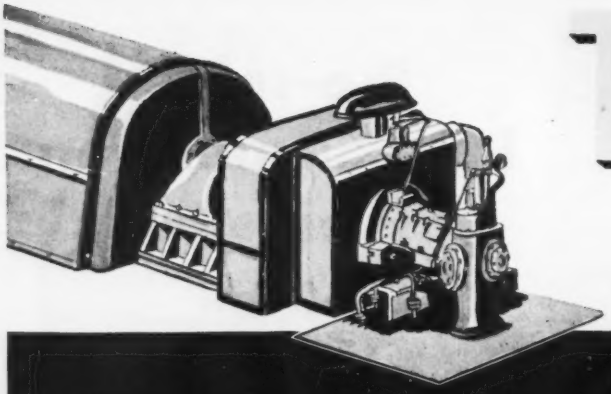
Fig. 98 has half the load deflection rate, and double the total working range of Fig. 268. Its 16 spring sizes accommodate loads from 74 lbs. to 9000 lbs. — but with a total working range *up to 5 inches!* Fig. 98 comes in the same seven types as shown for Fig. 268. Design details for identical types and sizes are the same for Fig. 98 and Fig. 268.



GRINNELL

WHENEVER PIPING IS INVOLVED

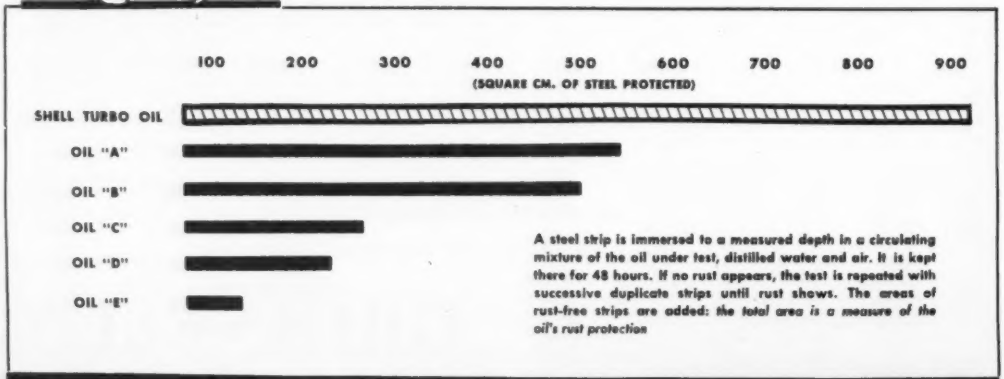
GRINNELL COMPANY, INC., Providence, R. I. Warehouses: Atlanta • Billings • Buffalo • Charlotte • Chicago Cleveland • Cranston • Fresno • Kansas City • Houston • Long Beach • Los Angeles • Milwaukee • Minneapolis • New York Oakland • Philadelphia • Pocatello • Sacramento • St. Louis • St. Paul • San Francisco • Seattle • Spokane



Today's

Improved SHELL TURBO OIL

"LOOK AT THESE RUST-PROTECTION FIGURES"



A steel strip is immersed to a measured depth in a circulating mixture of the oil under test, distilled water and air. It is kept there for 48 hours. If no rust appears, the test is repeated with successive duplicate strips until rust shows. The areas of rust-free strips are added: *the total area is a measure of the oil's rust protection*

Improved SHELL TURBO OIL for

Surest Safeguard

for MAJOR TURBINE INVESTMENT

The one lubricant that provides this

outstanding 5-way protection

Because of the tremendous responsibility entrusted to operators of large steam turbines, and because of the heavy investment each unit represents, Shell Oil Company has been concentrating on a lubricant research project of primary importance to utility and industrial executives.

The product now offered, Improved SHELL TURBO OIL, exceeds *every* accepted specification for premium turbine lubricants. It offers these five outstanding improvements:

1. **Highest known rust protection**—An entirely new combination of rust inhibiting additives effectively retards the formation of rust—an action which with proper maintenance will continue for the life of the turbine. Rusting problems are reduced to the very minimum in any turbine protected by Improved Shell Turbo Oils.

2. **Outstanding Oxidation Stability**—Improved Shell Turbo Oil contains the same time-proved anti-oxidant which has compiled such an extraordinary record of oxidation stability in the original Shell Turbo Oil. Service records for turbine units of all sizes . . . many operating for 10 to 13 years . . . show complete stability with respect to oxidation and sludge formation. In each of these units the oil gives every indication of matching the operating life of the turbine itself.

3. **Anti-foaming**—With the effective anti-foam agent now in Shell Turbo Oil, air entrainment can be tolerated for considerable periods, thus avoiding unscheduled shutdown.

4. **Excellent Emulsion Characteristics** — Improved Shell Turbo Oil provides the greatest protection against rust and oxidation yet achieved. Moreover, this protection is attained without any tendency to form objectionable water emulsions in service.

5. **Protection against wear**—The specially developed rust inhibitor used in Improved Shell Turbo Oil has the added faculty of reducing surface wear . . . adding to the protection afforded by the Oil itself. Because of this "anti-wear" effect, Shell Turbo Oil provides a welcome margin of safety for the bearings and gears during the critical starting and stopping periods.

Samples and complete information on the Improved Shell Turbo Oil will be sent promptly on receipt of your letterhead request. Address: Shell Oil Company, 50 West 50th Street, New York 20, N.Y. or 100 Bush Street, San Francisco 6, California.

SHELL

central station and industrial turbines

TESTED IN THE TOUGHEST LAB . . .

Southern States Type PBO Hookstick Disconnecting Switches have been thoroughly proven on thousands of applications in the field . . . *the toughest laboratory of all.* Easy operation, controlled contact pressure and sturdy construction give the type PBO a combination of vital features necessary for long, trouble free service.

Note these outstanding features:

- Extra large operating ring of heavy duty construction
- Automatic latch and blade pry-out
- Terminal pads with standard drilling on 1¾" centers
- Belleville spring washers at hinge and jaw maintain high pressure on double line contacts. Positive contact assured by wiping action of accurately machined surfaces.
- Trussed, hard drawn copper bus bar blades; double blade construction
- Rigid, wide flaring, cast blade guides
- Steel bases, hot dipped galvanized after fabrication are available to specification

Automatic latch closed showing positive engagement of latch. Cannot open under load. Latching mechanism is completely independent of operating ring. Extra large operating ring for easy hookstick insertion.

POSITIVE LATCHING — EASY PRY-OUT ACTION OF SOUTHERN STATES TYPE PBO

Latch clears under hookstick pressure. Pulling force applied to the ring from any normal operating position opens latch easily. Rugged latch construction, good leverage provide excellent ice-breaking characteristics.

Southern States Type PBO switches are available in all capacities from 400 to 3000 amps and 7.5 to 115 kv for all types of single pole, disconnect switch installations. The type PBO conforms in every respect to NEMA, AIEE and ASTM standards.

Write today for Bulletin No. 405 for complete engineering information on SS Type PBO outdoor, single pole, disconnecting switch.

Southern States Equipment Corp.
HAMPTON GEORGIA

GUARANTEE
QUALITY ELECTRICAL
TAPES
BLUEPRINT FOR KNOW-HOW!
ACCURATE
FRICTION TAPES
ACCURATE
FRICTION TAPE
Quality made of highest grade rubber and finest cotton base. Affords maximum mechanical protection. Available in Standard and A.S.T.M.-Specification grades.
ACCURATE
RUBBER TAPES
ACCURATE
Offers high elasticity, excellent cohesion, high dielectric strength and super aging qualities; made in both Standard and A.S.T.M.-A.A.R. grades.
ACCURATE
PLASTIC TAPE
Thin caliper reduces bulk in tight spots. Strong mechanically and offers high dielectric strength. Recommended for use wherever plastic tape is practical.
TAPE TIPS:
FOR ELECTRICAL MEN
Using rubber tape that coheres without heat or extra pressure, makes taping jobs easier, quicker. That's ACCURATE, and super aging means your "wraps" improve with age. Remember — friction or rubber, ACCURATE Tapes make accurate wraps!
ACCURATE
YOUR BEST BUY IN TAPE
MORE THAN A QUARTER CENTURY OF TAPE SPECIALIZATION

Now...
±10% Regulation...
AT THE SUBSTATION
OR ON THE LINE

in 16 1¼% Steps

with New URL-16 Voltage Regulator

AN IMPORTANT ADDITION TO THE URL-B LINE... ASSURES MORE REVENUE FROM HEAVILY LOADED RURAL AREAS Here's a new low-cost answer to regulation in rural or suburban areas . . . at the substation or on the line. This new regulator increases the URL line for application in locations where a ± 10% regulator is required. Sixteen 1¼% step operation meets these requirements under any load condition, at a minimum of cost. Light weight, combined with greater range and close voltage regulation, provides new installed economy.

CHECK THESE MONEY SAVING FEATURES...

10% **REGULATION,** RAISE AND LOWER, **IN 16 STEPS OF 1¼% EACH** . . . Combines light weight for single-pole mounting with regulation for substation application. A double-purpose feature that cuts costs. Regulator retains every outstanding URL feature, including cover-mounted bushings and co-ordinated surge protection by means of externally mounted arresters.

SIMPLE TAP CHANGER, WITH REVERSING SWITCH FOR ± 10% REGULATION . . . Has direct motor drive, quick motion. Separate oil immersion. Cuts maintenance. Assures positive arc interruption and minimum voltage variation during tap changing period.

PACKAGE CONTROL . . . Voltage regulating relay and auxiliary relays are mounted in a common flexitest chassis. Inherent inverse time-delay action of the voltage regulating relay assures long contact life. Separate resistance and reactance line-drop compensator provides rated line-drop compensation even though regulator is carrying only 67% of rated load.

IMPROVED CONTROL CABINET . . . Control cabinet door is hinged at bottom to provide a "workbench" when in the open position. Control cabinet may be mounted integrally with the regulator or on the pole below the regulator.

FOR FURTHER INFORMATION on the new URL-16 Regulator, call your Westinghouse representative, or write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70601

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How to help you achieve peak efficiency in Fly Ash collection is the prime function of Buell engineers. These men, backed by years of experience in weighing the factors which determine the most efficient and economical equipment for each installation, will be pleased to discuss your particular problems at your convenience. No obligation, of course.

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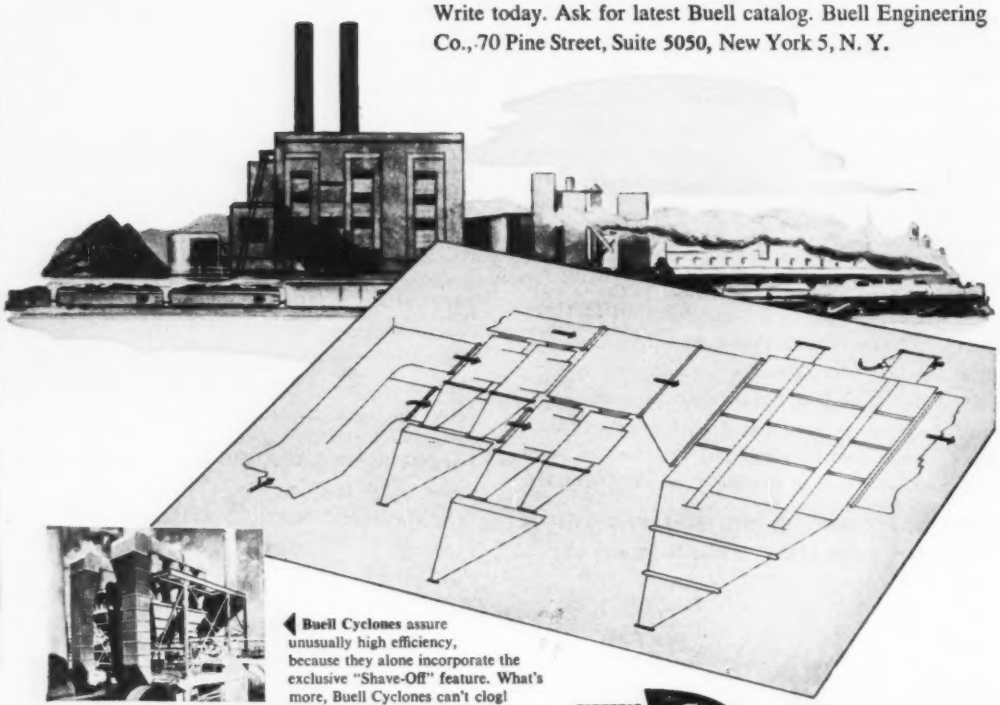

Buell Cyclones assure unusually high efficiency, because they alone incorporate the exclusive "Shave-Off" feature. What's more, Buell Cyclones can't clog!

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Electrical Engineer, James Paul Warner

"Lo-Loss" Busway was chosen for this application because of its *proved flexibility* as a riser bus in commercial buildings . . . its light weight . . . its ease of installation. Factory fabricated sections required minimum space and saved installation time—both of prime importance to any modernization job. Now, branch circuit take-offs can be made at various floors, eliminating separate circuits and long conduit-cable runs from the main switchboard. Minimum voltage drop is assured by insulated copper bars on close centers.

Designed to carry current up to 4000 amperes at 600 volts or less, NE Busway is the most economical, convenient, flexible and salvable layout possible for commercial or industrial buildings. Send for information today.

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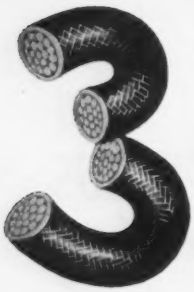

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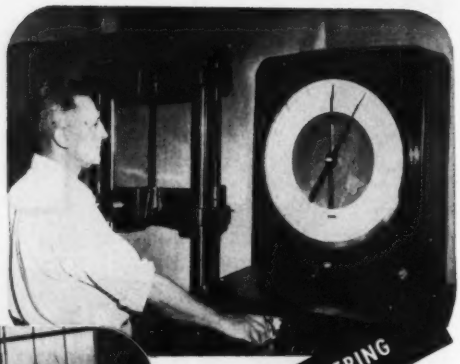
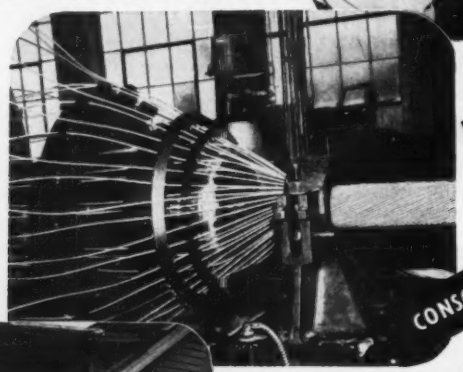


FINE ENGINEERING



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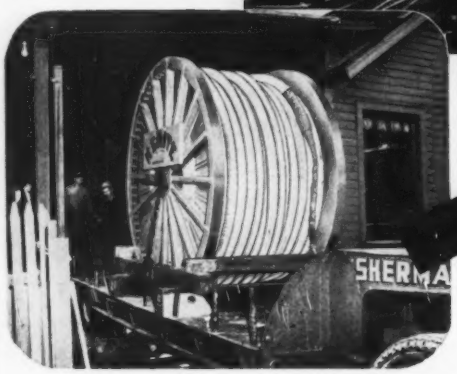

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Editorials

Follow These Guides for Future Action

The annual meeting of the Edison Electric Institute has always been the electrical industry's sounding board. Here are presented many serious proposals for industry improvement by top executives in utilities and allied fields.

Presented in these colums are the more important recommendations submitted by the various speakers. We are not thereby sponsoring any or all of them. But it is our firm belief that all of them deserve sincere consideration. Most of these proposals should become guideposts for future action by all units of the industry.

"Be sure that no one can ever again say that 'power companies did not think big enough' or could not marshal enough money or courage in risk-taking to do what the country needed or was about to need, power-wise."

"Each of you has the responsibility of keeping the people you know, and the community you serve, informed on the vital need of electric power in this defense effort and of the steps that are being taken to meet that need."

"It is our individual responsibility to organize our activities so that as much time as possible will be allowed for . . . increases in the production of critical materials to take place. This means postpone all unnecessary projects; effect all possible economies in design and installation and closely coordinate construction with actual load conditions."

"You gentlemen are out in front—in the combat area—in the struggle to keep our government out of business. That is your assignment as citizens even though it was not of your own choosing."

"You have opportunities every day to advance the cause of freedom amongst your associates in business, amongst your employees. It is really a very great responsibility . . ."

"Industrial electrification requires a continuous, well planned program with long-range objectives . . . Our efforts must be aligned with our long-range objectives, rather than our day-to-day sales requirements."

"Industrial electrification responds to bold experimentation in techniques . . . We must continue to experiment boldly, and give support to the daring men in our organizations, if we are to remain at the forefront."

". . . the big job ahead of us in the rural areas is to make electricity do still more for the farmer . . . Rural electrification is one of our big responsibilities and one of our big opportunities to serve America."

"Providing the incentive for young men to become engineers is the job for all of us."

"System interconnections are drawing us closer together as an industry, making more of our problems common problems. Electric Energy, Inc, . . . the joint project of five different systems to supply atomic energy power needs, is still another example (of cooperative programs) . . . This is a good trend. It should be continued and expanded."

The Gadsby From Utah

For the first time since the office was made elective in 1946, the new president of Edison Electric Institute is from the Far West. With the election of George M. Gadsby, president of Utah Power & Light Co, the industry has chosen as its leader during the critical phases of mobilization ahead not only a practical, hard-headed operating company executive, but an engineer with a unique appreciation of the need for telling the industry's story at the local level. His frequent and extended contacts with government in his territory has, over the years, given him a balanced outlook on the relationship of the industry to government.

In Gadsby the industry has picked a man who is poised and persuasive in his speech and sophisticated in his outlook. His tastes are sufficiently cosmopolitan to support an active interest in the fine arts without excluding the keen enjoyment of the daily doings of Dick Tracy and Orphan Annie.

The son of a railroad YMCA secretary who later became a Congregational minister, Gadsby was born May 4, 1886. He attended Marietta, (Ohio) College, graduating in 1906, magna cum laude and Phi Beta Kappa.

After taking an MA degree from Marietta in 1907 he attended MIT for two years, receiving a BS degree there in 1910. He received the honorary degree of Doctor of Engineering in 1928 from the University of Pittsburgh and in 1941 an LLD from Marietta College.

On leaving MIT he joined the Warren (Pennsylvania) Water Co, subsidiary of the American Water Works and Electric Co. From there he went with American Water Works to Pittsburgh, Little Rock, and later New York. He went to work for West Penn Power Co, Pittsburgh, in 1917 and nine years later became president.

Gadsby joined Electric Bond and Share Co in 1929 and went to Utah as chief executive of Utah Power & Light, planning to remain a short time. Subsequent developments and a real love for the inter-mountain people caused him to give up any thought of leaving.

Gadsby's easy, persuasive speech is the tool of a keen and analytical mind. In argument he seldom raises his voice but relies on skillful marshalling of logic, driving home points with a gentle jab of his forefinger.

To Gadsby the industry's greatest need is to warn the man on the street of his own danger: to show him what he can lose through passive acceptance of the government's encroachment in the power business. The final choice is his to make. "If your best interests lie in our continuing to supply you with our service and our contributing to the support of your institutions, through taxes, we ask you to accept our philosophy."

To take this story to the man on the street, Gadsby believes there must be more and better coordination between the industry's several service organizations and EEI. He will not sponsor the merging of these various groups. On the other hand, he feels that individual company leaders must be better informed on issues facing the industry. Coordination can accomplish this.

Equipped with the information they need, local company executives are best qualified to interpret the industry to the people in their own communities, he feels. As practical business men, their views will be respected by local people.

But Gadsby recognizes that coordination of industry groups alone will not meet the problem. Some way must be found to convince every man in the utility industry today that he and his company are part of the most important single issue in government today—regardless of his job or the region in which he lives.

Gadsby and the views he holds are summarized in these lines often quoted to his associates:

> ". . . No man is an island entire of itself; every man is a piece of the continent, a part of the main; if a clod is washed away by the sea, Europe is the less . . . any man's death diminishes me, because I am involved in mankind; and therefore, send not to know for whom the bell tolls; it tolls for thee."

Chapman Visits North Carolina

Perhaps Secretary of the Interior Oscar Chapman had not heard that Governor Scott had asked for an investigation of the power situation in North Carolina when he spoke at the annual convention of the N. C. Junior Chamber of Commerce on May 19, 1951. Surely he would have helped Scott beat the drums for subsidized federal power.

But on the contrary, we find Chapman making a speech in North Carolina and promoting private enterprise. He talked about the need for synthetic liquid fuels. He said, "Government has worked with industry in exploring and developing the processes by which that production can be undertaken. But the job of actually producing the fuels on a commercial basis, as an important source of supply for our economy, is a job for private industry."

It would be wishful thinking to suppose that Chapman has begun to sponsor private enterprise. There is too little difference between energy from fuel and energy from water power. So why would Chapman wish the former developed by private enterprise and the latter by the federal government?

Our Political Democracy Is Second Rate

Americans are quite fond of bragging about their political democracy. Few realize that it is only second rate to our marketing democracy. In the former the voter usually has to "buy" one of two candidates, and both are likely to have some bad points. In the latter the buyer usually has many competing products from which to choose. The fall of the private enterprise system would be more severely felt in the marketing democracy than in the political. Imagine the U. S. with only one brand of electric appliances, one make of auto, one brand of food. Government ownership eventually would mean just that.

The Electrical Week

INDUSTRY MOBILIZATION—James F. Fairman succeeds Clifford B. McManus as Depa administrator (p 92) . . . Companies must report distribution of copper, steel, and aluminum allotments on new form, Depa-6 (p 92) . . . General procedure for electric utility projects under CMP outlined by Depa (p 93) . . . Defense Mobilizer Wilson thinks electric power supply for defense during next year and a half will be a critical problem (p 93) . . . Industry M orders are listed on p 93.

WASHINGTON—Navy's Bureau of Yards and Docks is converting 11 railroad-car power plants originally destined for Russia for emergency use in the U. S. (p 99) . . . OPS following old OPA formula in intervening in utility rate cases (p 100).

ELSEWHERE—George M. Gadsby elected president and Bayard L. England, vice president, of EEI at annual convention in Denver (p 94) . . . Utah Power & Light, the company behind Gadsby, has increased output 50% since World War II (p 96) . . . Short-term meter supply is good, but long-run picture is less reassuring, New York Electric Meter Engineers' Committee hears (p 98) . . . Tentative BPA plan asks 2 million-kw expansion for Pacific Northwest by 1954 (p 99).

• • •

Robert R. Rose, Jr, mayor of Casper, Wyo., was nominated by President Truman to be Assistant Secretary of Interior. Rose, a 35-year-old lawyer, would succeed C. Girard Davidson, who recently resigned.

President Truman stepped into Interior's fight to have the Senate restore money cut from its power budget by the House. In a letter to Carl Hayden, Arizona Democrat, he charged the House amendments to Interior's appropriation bill would cripple an expanded public power program needed for defense production.

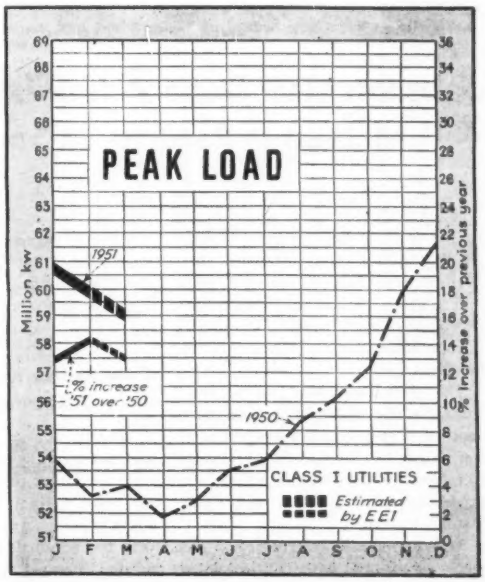
Industry can expect to get just half of the 38,000 engineering students who will be graduated this month, a survey by the Engineering Manpower Commission of Engineers Joint Council indicates. The other half will be available to the armed services. Industry, the commission estimates, needs about 30,000 engineering graduates a year.

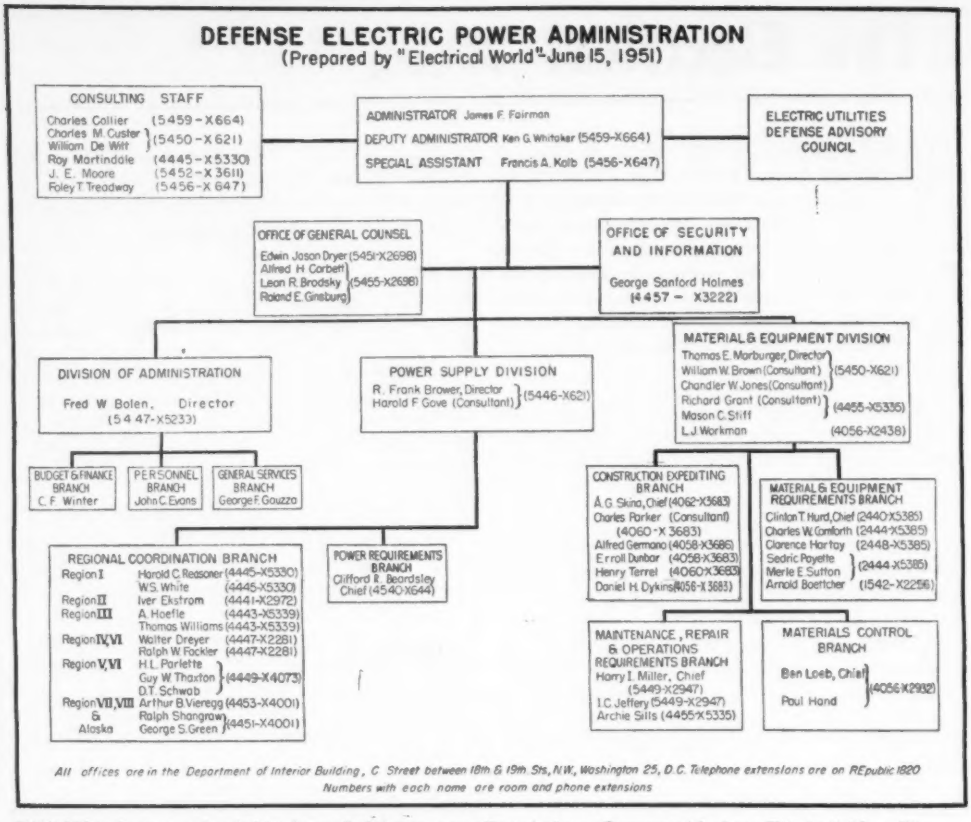
Congressmen from Kentucky and Tennessee coal districts are raging because TVA plans to use natural gas as an alternative to coal in its new plants at New Johnsonville and Paducah. The Congressmen are urging FPC expressly to forbid the use of gas either alternatively with coal, or exclusively.

CBS and RCA announced they would have at it in a color duel within the next few weeks. Columbia said it would put on its first (FCC-approved) commercial color show next Monday. And, you might know, the show will feature Arthur Godfrey. Radio Corp of America said it would begin public demonstrations of its (FCC-rejected) color system July 9. Its programs will be transmitted under an experimental license held by NBC, an RCA affiliate.

Last entrant in the Bob Hatfield Kwhr Pool was C. S. Coggeshall of General Electric Co, who predicted 365.19 billion kwhr output for 1951. This is 11% over the 329 billion kwhr countrywide output in 1950.

Sale and use of all copper raw materials will be brought under detailed NPA supervision if a proposed order is carried out. This order would require anyone except refiners, scrap dealers, and brokers to get special permission to obtain scrap and refined copper and copper base alloys.

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(Prepared by "Electrical World"-June 15, 1951)
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All offices are in the Department of Interior Building, C Street between 18th & 19th Sts, N.W., Washington 25, D.C. Telephone extensions are on REpublic 1920
Numbers with each name are room and phone extensions

CHANGES in Depa, now headed by James F. Fairman, are reflected above. Compare with chart, EW, April 23, p 88

Fairman New Depa Administrator; McManus Returns to Southern Co

James F. Fairman has succeeded Clifford B. McManus as administrator of the Interior Department's Defense Electric Power Administration. McManus, who helped organize Depa and served as its first head on a temporary basis, has returned to Atlanta to resume his duties as president of the Southern Co.

The shift occasioned no surprise. Administrator Fairman, a vice president of Consolidated Edison Co of New York, has been serving as deputy administrator since March and he was expected to head Depa after McManus' departure.

A native of Michigan, Fairman has been associated with Consolidated Edison and its predecessor companies since 1925, when he joined the engineering staff of Brooklyn Edison Co.

Interior Secretary Oscar L. Chapman lauded McManus' service with the controls agency as a notable contribution to the mobilization program.

•

Companies Must Report Allotments on Depa-6

Electric utilities are now receiving allotments of copper, steel, and aluminum for major plant additions during the third quarter from the Defense Electric Power Administration. Along with the allotments comes a new reporting form—Depa-6.

The new form is designed to show disposition of allotments by utilities to their suppliers. They must be returned to Depa within 15 days of the receipt of each allotment for a major addition.

This gives utilities little leeway in firming up the placing of orders for materials, but the alternative is possible cancellation of an entire allotment if the Depa-6 form is not filed. Implication is that, where there is any doubt as to a supply of alloted material, a utility should order as much as possible and ask Depa for more when needed later.

Where orders subsequently are cancelled by suppliers, it must be reported to Depa by letter.

The controls agency also advised utilities they must compute all future minor requirements for aluminum conductor on the basis of net aluminum content, rather than upon the gross weight of the conductor.

Procedure for Utilities Under CMP Outlined by Retiring Depa Director

General procedure for electric utility projects under CMP was outlined last week in a letter to the power companies. Former Administrator Clifford B. McManus of the Defense Electric Power Administration sent the information to all public utilities.

After explaining that it will take some time to put CMP into operation and convert DO orders to CMP rated orders—with occasional delays in materials deliveries likely to occur during the transition period—McManus gave this summary of operation under the plan:

Three Material Categories

"Three important categories of material are involved in the operation of CMP:

"1. 'Controlled materials' means copper, aluminum, and steel in various forms and shapes listed in Schedule 1 of CMP Reg 1.

"2. 'B products' means products listed in the official CMP class B products list, which is available in NPA field offices. In general, these are stock items not manufactured to specifications for a particular purchaser.

"3. 'A products' means products which contain controlled materials but are not included in the official class B products list.

Depa Backing Required

"Under CMP the electric utility program will be on project approval basis. Each major plant addition approved by Depa will be backed up by rating authority. Each electric utility will receive from Depa allotments of steel, copper, and aluminum for each approved major plant addition which will include both the controlled material content of A products and controlled materials as such, required for the project. In addition, each electric utility will receive an authorized rating which may be applied to orders for other materials required in the major plant addition.

"The following example will illustrate how electric utilities will operate under CMP: 30 tons of steel are required to construct a transmission line and substation, of which five tons are for reinforcing bars (which is a controlled materials as such), and 25 tons are for steel towers (which is an A product).

"You will receive an allotment of 30 tons of steel from Depa. You will pass on to the mill five tons of your allotment with your order for reinforcing bars and will apply the CMP allotment number to this order. You will apply a CMP allotment symbol to your order for tower steel and you will pass on with your order to the fabricator an allotment for the remaining 25 tons of steel; the fabricator will in turn pass on to the mill the symbol and allotment of 25 tons of steel.

"To obtain B products required in the project, such as pole line hardware, you will apply the CMP rating to your order. It will not be necessary to pass on to the supplier of a B product any of your controlled materials allotment, since the material requirements of a producer of B products will be handled directly through the various NPA industry divisions."

•

Power for Production Is Problem to C. E. Wilson

Electric power supply for expanding defense industries during the next year to 18 months may be one of the most critical problems of Washington's mobilization officials.

Mobilization Director Charles E. Wilson indicated this in a press conference last week.

The problem, as Wilson outlined it, is to find enough power to operate new steel, aluminum and chemical plants and for Atomic Energy Commission facilities as they are completed in the next year or so. Wilson made it pretty clear he was not certain yet that sufficient new generating capacity would be ready as fast as the other new production facilities.

Expansion of defense plants will continue throughout the mobilization period, Wilson pointed out, but the program's impact in terms of demand for raw materials, especially metals, and electric power will be the heaviest within the next 18 months. The Atomic Energy Commission alone must find upward of one million kw in new capacity in the next year or so, he reported.

C. R. BEARDSLEY, chief, Power Requirements Branch, Power Supply Division of Defense Electric Power Administration

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Industry M Orders

The following M order amendments of interest to the electrical industry have been issued by the National Production Authority. Orders not of interest have been omitted. Copies of orders may be secured from the National Production Authority, Washington 25, D. C., or any regional office of the Department of Commerce.

Amendments to Previous Orders

Amendment to M-1 increases percentages of iron and steel castings producers are required to reserve for DO-rated orders during the third quarter. Also sets new lead time of 90 days for alloyed iron products.

Amendment to M-50 adds steel as a program material for maintenance and expansion of electric power facilities. Establishes quotas of steel, copper, and aluminum for minor requirements by the industry for the third quarter of 1951.

•

Named DSFA Deputy

Charles R. Ferguson, former United Mine Workers official, has been named deputy administrator of the Defense Solid Fuels Administration. Ferguson, a native of Dellslow, W. Va., has been assistant safety director of UMW since 1943. He served in the Navy during World War II.

Gadsby and England Elected By EEI

Three Utilities Get Claude L. Matthews Valor Award at Convention in Denver; Wisconsin P&L Wins Reddy Kilowatt Annual Report Award

(See Front Cover)

George M. Gadsby has been elected president of Edison Electric Institute to succeed Louis V. Sutton.

The president of Utah Power & Light Co is the first president selected from the Far West since the office was made elective in 1946. (A biographical sketch of Gadsby appears on p 90.)

The new vice president will be Bayard L. England, president of Atlantic City Electric Co.

England is one of the best known power company presidents in the country. He has been host to more EEI conventions than any other utility head.

Joined Utility in 1924

Born in Newark, he attended Atlantic City schools and was graduated from Temple University. He began his career with Atlantic City Electric in 1924, later serving as division manager, commercial manager, and general manager. He became president of the company when it was divested from American Gas & Electric Co. He is also president of the New Jersey Utilities Association.

The South Amboy, N. J., munitions explosion, a severe oil fire in a St. Louis substation, and frost and snow in the mountains of Utah were the settings for acts of heroism and courage which won the Claude L. Matthews Valor Award for 1950.

Get Heroism Awards

Employees of Jersey Central Power & Light Co, Asbury Park, N. J.; Union Electric Co of Missouri, St. Louis, Mo; and Utah Power & Light Co, Salt Lake City; respectively, won the awards.

Established by Claude L. Matthews, president of W. N. Matthews Corp, St. Louis, the Valor Award honors acts of devotion to duty by electric utility employees which call for extraordinary courage in efforts to maintain important electric service or to restore service in the shortest possible time.

EDMUND W. OESTERREICH, second from left, is congratulated after receiving EEI bronze plaque for his pole top method of resuscitation (EW, June 4, p 13). George Fritz, Duquesne Light Co, second man saved by method, expresses appreciation as his mother, Mrs. John Fritz, and daughter, Pearl Annabelle, echo his words

COFFIN AWARD is presented to Georgia Power Co for inspiring community betterment in its service area. Charles A. Collier, center, accepts award from General Electric Co Pres Ralph J. Cordiner as Louis V. Sutton, retiring EEI president, looks on. Company was cited for Champion Home Town Contest (EW, June 4, p 5)

The explosion of munitions barges at South Amboy on May 19, 1950, which killed 33 people and caused over $20 million in property damage, occurred only 550 yards away from the South Amboy Plant of Jersey Central. The blast collapsed walls, twisted steel, and blew 2,300 live antipersonnel mines into the plant and on plant property. Despite wounds and shock, the 15-man plant crew went calmly about the job of shutting down the station to prevent further damage and switching the load so that

ANNUAL REPORT awards in Reddy Kilowatt contest are accepted for their companies by Executive Vice Pres M. H. Frank, left, Wisconsin Power & Light Co, first prize; and Vice Pres R. W. McClure, Kansas Power & Light Co; Pres J. M. Bell, New York State Electric & Gas Corp; and Pres C. E. Oakes, Pennsylvania Power & Light Co, honorable mentions. Special mentions were accepted by Pres D. C. McKee, Empire District Electric Co; and Allen Van Wyck, Illinois Power Co

electric service could be maintained to the stricken city.

"Only after these operations were completed did the men seek medical attention and information about their families in the blast area," states the award citation.

Bravery under different circumstances was displayed by Henry Schwend, a traveling operator for Union Electric of Missouri, when, on Oct. 8, 1950, he arrived at an important distribution substation in St. Louis, and discovered flames leaping 25 to 30 feet above a transformer.

"Single-handedly and at great personal risk," Schwend's citation reads, "he prevented the fire from spreading to the entire substation, brought it under control without a power outage, and protected the lives of fire fighters unfamiliar with high-voltage equipment . . . The courageous and prompt action of Mr. Schwend was in keeping with the high traditions of the electric service industry."

One hundred and twenty Utah Power & Light employees were cited as a group for the Valor Award as a result of their "heroic devotion to duty in working night and day under extremely hazardous conditions of frost, snow, and dense fog on the patrol and repair of lines to avert a major outage on the entire system." Vital transmission wires became thickly coated with frost (Dec. 22-28, 1950), and failures were occurring in mountainous areas.

"Climbing, repairing, and patrolling were extraordinarily difficult and dangerous as frost accumulated on tools, materials, and the men themselves," the citation states. "Despite these critical conditions, there was only one system shutdown of very short duration and not a single accident."

Because its 1950 annual report to stockholders "best illustrates, humanizes, and simplifies" company operations, Wisconsin Power & Light Co, Madison, whose president is Grover C. Neff, received the Reddy Kilowatt Annual Report Award.

Among features singled out by the judges in their citation of the Wisconsin report were its "statement of the philosophy and goals of the company and the industry."

Three electric companies whose reports were judged to be "outstanding" were awarded Honorable Mention Certificates—Kansas Power & Light Co, Topeka, D. E. Ackers, president; New York State Electric & Gas Corp, Binghamton, Joseph M. Bell, Jr, president; and Pennsylvania Power & Light Co, Allentown, Charles E. Oakes, president. Special mention was accorded to Empire District Electric Co, Joplin, Mo., and Illinois Power Co.

WINNERS of Claude L. Matthews valor award were employees of Jersey Central Power & Light Co (left photo), represented by Load Dispatcher A. D. Vanderbilt, Watch Engineer A. R. Eckman, Supt J. E. Casey, and Pres E. H. Werner; Union Electric Co (center), represented by Travelling Operator Henry Schwend and Pres J. W. McAfee; Utah Power & Light Co (right), represented by Line Crew Supt W. W. McClure and Pres G. M. Gadsby. Rives Matthews made the presentations

The Company Behind George Gadsby

Utah Power & Light, headed by Edison Electric Institute's New President, Has Increased Its Output by 50% Since World War II

The utility behind the man the electrical industry elected to head its trade association has increased output 50% since the war. That the organization of Utah Power & Light Co is sound speaks for the administrative ability of George M. Gadsby. Edison Electric Institute's new president has served since 1929 as the company's president and general manager.

Great Industrial Growth

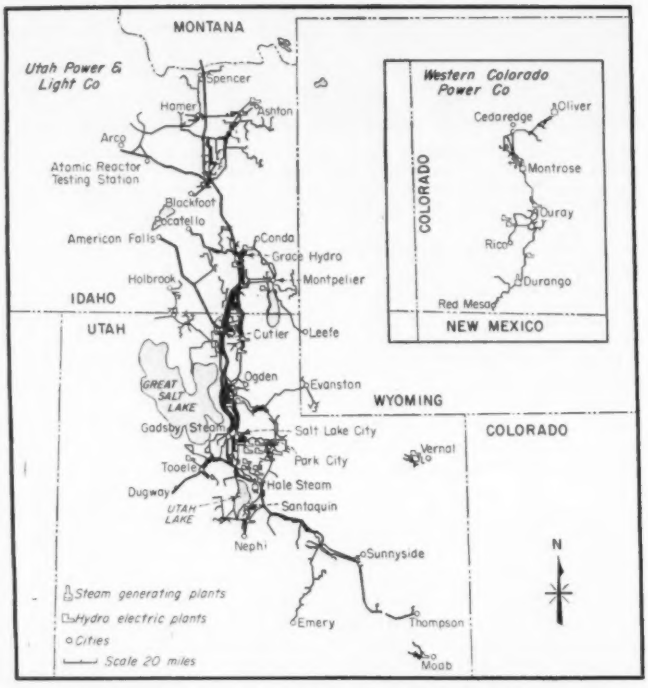
Gadsby, a former president of West Penn Power Co, has seen his system expand considerably since '29. Westward shift in population and a phenomenal growth of industry in the area have contributed much to this expansion. The last war and the new emergency have placed large military and defense industry loads on Utah's lines. One of these is the Atomic Energy Commission's Reactor Testing Station near Arco, Idaho, served by UP&L and Idaho Power Co.

Areas served by the Salt Lake City utility and its subsidiary, Western Colorado Power Co, are diversified, geographically and industrially. The parent company serves 20,000 square miles of north-central Utah, southeastern Idaho, and southwestern Wyoming. Its territory extends 400 miles from Ashton, Idaho, near Yellowstone National Park, to the southeastern border of Utah. Its east-west limits are 160 miles apart.

Subsidiary Serves Colorado

The Colorado company serves 3,000 square miles on the western section of Colorado, extending from Oliver on the north to a point near the Colorado-New Mexico border on the south.

The area's industrial complex includes steel, copper, coal, oil, manufacturing, agriculture, and extensive defense establishments. New industry has brought with it new population. There are now 640,000 persons in the two service areas, an increase of 30% since 1940. The companies now serve 170,000 customers in 416 municipalities and on thousands of farms.



MOUNTAIN WEST area served by Utah Power & Light. Inset shows area served by Western Colorado Power Co, wholly-owned subsidiary of Salt Lake City utility

Increases in industrialization and population are reflected in the electric loads of the two utilities. Peak load and system input each went up 51% since 1946. Last year peak load reached 304,000 kw and system input climbed to 1.5 billion kwhr.

The organization feels its revenues are an indication of the stable economy of the area. In 1950, 42% of it came from residential and farm customers, 26% from industrial, 21% from commercial, and 11% from sales to other utilities and miscellaneous customers.

More than 95% of the companies' industrial sales come from facilities vital to defense. Among these are cement plants, coal mines, flour mills, iron and steel fabricating plants, nonferrous mines and mills, oil refineries, railroads, and the military installations.

The federal government has invested more than $200 million in military and naval supply and repair bases in Utah and southeastern Idaho. Because of their strategic geographical location, away from dangers inherent to the coasts, they are being expanded rapidly. More than 25,000 civilians are now employed in these establishments—twice as many as a year ago.

Load added during World War II was carried easily. Near the end of the war a large Utah industry on the northern company's lines built its own power plant, releasing 65,000 kw

for new customers. At a time when equipment was impossible to get, this had the effect of building a 65,000-kw plant on the company's lines.

Area growth after the war rapidly absorbed this released capacity, and the companies determined to expand generating, distribution and transmission facilities to keep ahead of demand.

The $68 million expansion program that resulted, now in its third year, will add 85% to the system's capacity. The expenditure equals three quarters of the companies' total plant investment at the close of 1948.

Three New Units Operating

Three generating units started under the program have already came on the line. They were a 40,000-kw addition to the steam-electric Hale Plant; a 6,250-kw steam-electric plant at Montrose, Colo.; and a 3,500-kw hydroelectric plant at Tacoma, Colo.

In Salt Lake City the No. 1 section of Gadsby Plant, named for the president, will add 60,000 kw capacity this year. A second section, now under construction, is scheduled to be completed in October 1952 and will add 75,000 kw.

Fuel for the No. 1 section will be by-product pitch, transported 4½ miles through a pipe heated to 260 degrees F. Heated storage for the pitch is provided at each end of the pipeline. Gadsby No. 2 will burn coal.

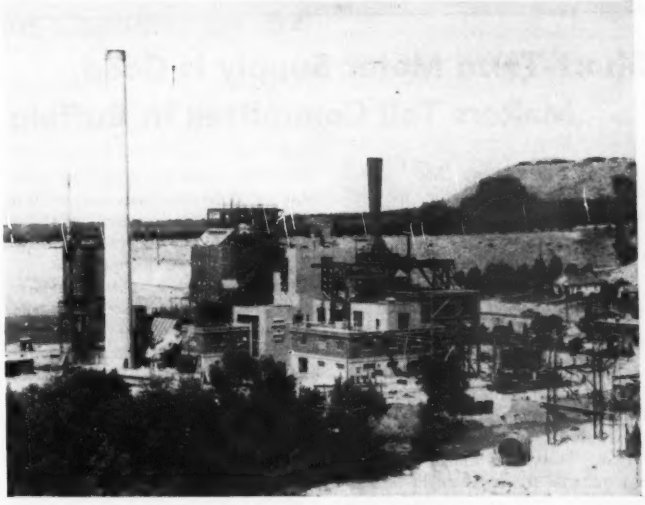
Supplies AEC Station

Major new transmission line construction included a 45-mile, 130-kv line to serve the AEC Reactor Testing Station and a line to serve the Army's $25 million Chemical Warfare Proving Ground at Dugway, Colo.

The Utah company is interconnected with Idaho Power through a 130-kv line and two 44-kv lines. It has a 161-kv interconnection with Montana Power Co, making it part of the 5.5 million-kw Northwest Power Pool. The Colorado company supplies power through interconnections to four rural cooperatives in its area.

A look at the organization's financial side shows its capital structure consists of 1.5 million shares of common stock totalling $31.2 million, $7 million of earnings retained for use in the business, and $85.5 million of long-term debt. Ratio of equity capital to the total is 39.

HYDROELECTRIC PLANTS, as well as steam, are used by UP&L to keep capacity ahead of demand. Shown is company's Soda Station in Idaho, first of five to harness waters of Bear River. River system has an installed capacity of 125,000 kw



HALE STEAM PLANT at the mouth of Provo Canyon in central Utah produces 62,750 kw. Newest and largest of UP&L's generating stations, it was the first to be completed in company's $68 million expansion program, now in its third year

Last year, common stock earned $2.75 a share in addition to $1.75 a share declared in dividends. Earnings were up 24½% and dividends, 46%. Payroll and employee benefits paid to the system's 1,913 employees totalled $7,192,075, an increase of 63% over 1949.

Although they do not merchandize electrical appliances, the companies are active in overall promotion. Last year they helped dealers sell $18 million of appliances, an increase of 27% over the 1949 figure.

A pioneer in development of farm electrification, UP&L has made electricity available to 97% of the farms in its service area.

PENNSYLVANIA ELECTRIC CO becomes the first electric utility to sponsor "March of Time Through the Years," TV film show. Here G. T. Clifford, Penelec advertising director, hands signed contract to Charles Stone, Station WICU-TV, Erie

Short-Term Meter Supply Is Good, Makers Tell Committee in Buffalo

Supply of meters and service boxes is still good for the immediate future but the long run picture is less reassuring. Utilities alone can guard against insufficient supplies by emphasizing that meters are essential for copper conservation.

This is what manufacturers told the New York Electric Meter Engineers Committee in Buffalo June 7-8. Threats to be warded off, they said, include even a shortage of plating materials for jaw contacts in socket devices. Discussion indicated a fear that material shortages might lead to omission of the contact plating and to less satisfactory spring material for the jaws unless effective representations were registered in Washington.

Discussion of the problem of terminating service wires at low roof houses led to passage of a resolution urging the Edison Electric Institute Meter Committee to adopt conformity with NEC requirements for national uniformity. Putting wood risers through the roof was generally characterized as a temporary method.

Authorization of socket meters in New York State has raised the question of difference between NEMA performance requirements and the stipulations for Underwriters' Laboratory approval. Meanwhile, manufacturers are reported anxious to have their entire lines of sockets approved as groups.

Manufacturers presented numerous innovations. Eastern Specialty Co. showed a small artificial burden designed to disclose faulty current transformer windings, one southern utility having used it to ferret out seven bad ones in the first month of use.

H. G. Farley reported that Westinghouse Electric Corp has tightened accuracy limits on watthour meter testing at the factory and introduced several improvements in laminations, the quadrature loop and light load adjustment. Westinghouse socket jaws will continue to be plated.

Sangamo Electric Co has a polyphase watthour meter with thermal demand in 2-element design and various terminal arrangements; also a small current transformer MB-6 for 200 and 400 amp with removable primary bar. Dana Johnson of Sangamo mentioned two grades of a new synthetic oil for escapements and demand-meter-motor ball-bearings.

Other manufacturers will be licensed, said Morgan Lewis, to make the Code Electric Co designs of gangboxes with by-pass and other features including a spring-reinforced socket jaw for 150 amp thermal capacity.

Other Manufacturers Report

F. L. Pavey reported reductions in copper content, heating, and number of parts of the current coils of Duncan meters. R. P. Taylor of Anchor Manufacturing Co promised early availability of heavy duty 200A polyphase sockets capable of No 4/0 wire but said he expected difficulty in continuing the plating of the jaws.

One southern utility is installing meters without test, relying on the certification of accuracy as shipped. This was cited by F. L. Duquette incidental to enumeration of new General Electric Co products. One was a new socket with reduced copper strapping and more accessible terminals, another an R-30 cyclometer register. Duquette said a Dremel Moto-tool can be used with a carboloy burr to etch numbers on glass meter covers.

New York Public Service Commission Engineer W. F. Adams interpreted the requirements in Case 278 for service checks of instrument transformers and reminded the metermen that all approvals of indicating type demand meters will lapse at the end of 1951. Group discussion had previously indicated hardly perceptible sentiment in favor of cyclometer registers for watthour meters.

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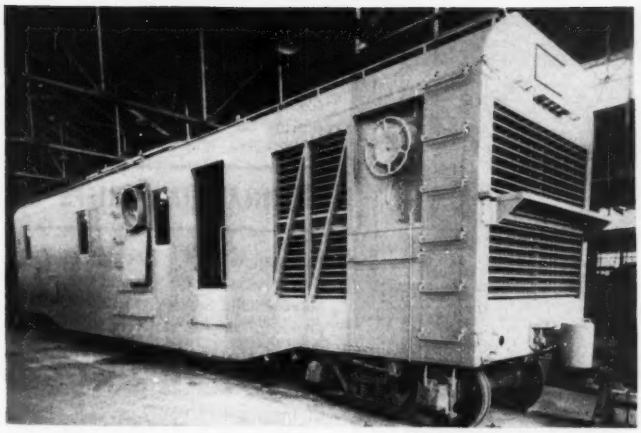
Installing Kearny Units

Work has started at the Kearny (N. J.) Plant of Public Service Electric & Gas Co on installation of the largest turbine-generators in the system, the company has announced. When completed, the plant will contain two 145,000-kw generators and auxiliaries. First unit is expected to be placed in service in the fall of 1952 and the second in the spring of 1953. Steam generators with controlled circulation, turbine for steam conditions 2350 psi and 1100/1050 F resuperheat, and generation at 20 kv will be used.



SOVIET UNION won't be getting this power car—the U. S. Navy will. Originally built for lend-lease to Russia, the car and ten others like it are being converted for use in emergencies here. Diesel-engine-driven generator inside develops 600 kw

BPA's Defense Plan for NW Urges 2 Million Kw Added Capacity by '54

Expansion of Pacific Northwest power resources to provide the addition of more than 2 million kw of installed electrical capacity by 1953-54 is recommended in the Bonneville Power Administration's 1951 advance program for defense. This expansion would be a part of the 20 million-kw increase for the entire nation as requested in President Truman's 1951 Economic Report to Congress.

Because of expanded operations of existing industries and creation of new defense plants, Northwest power requirements for the next three years will be higher than expected just before the Korean war, P. J. Raver, Bonneville administrator, says in the report. Even tripling of federal generation in the area would not assure sufficient power to meet both the defense demands and the region's normal load growth by 1958-59, Raver said. He reported that immediate and long-range acceleration of the production program can increase the regional peaking capacity from the present 2,268,000 to 8,378,000 kw.

The program outlined in the report proposes faster construction of McNary and Chief Joseph Dams, now being built in the Columbia River, and an immediate start of construction on the Dalles Dam in the Columbia and Ice Harbor and Hell's Canyon Dams in the Snake River. It also supports the proposed intertie between Oregon and California power transmission systems.

In the non-federal utilities field, construction already in progress or certified by the Defense Electric Power Administration calls for installation of 1,150,000 kw of new peaking capacity by 1954-55. These projects include: Ross and Gorge Plants, Seattle City Light; Cushman plant, Tacoma City Light; Rock Island Dam, Chalan County (Washington) PUD; Box Canyon Dam, Pend Oreille County PUD; seven Umpqua River plants in Oregon, California-Oregon Power Co; Bliss Project, Idaho Power Co; steam plant, Montana Power Co; River Mill Plant, Portland General Electric Co; Cabinet Gorge, Washington Water Power Co; and Yale Project, Pacific Power & Light Co.

Recommendations made in the advance program report were worked out by the Bonneville Power Administration in cooperation with the Bureau of Reclamation and Corps of Engineers regarding federal projects, and with private and public utilities regarding non-federal facilities.

11 Railway Power Cars Converted to Navy Use

Eleven railroad-car power plants, built for lend-lease to Russia but never delivered, are being converted to American specifications by the Navy's Bureau of Yards and Docks for emergency use in the United States.

The 600-kw units could provide at least the minimum current needed should existing power facilities be damaged by sabotage, bombing or natural disaster to such an extent that days would be required to make repairs.

Conversion of the power cars includes, among other things, removal of the 50-cycle diesel generator required for use in the Soviet Union but unusable in this country, and substitution of a standard 60-cycle generator. Cost of conversion is about $30,000 each.

As work on a plant is completed in St. Louis, the car is sent to a naval station and placed in standby status. Plans are to locate the plants in various parts of the country so that they would be able to render service at any trouble spot in a matter of hours through speedy movement by rail.

About 200 mobile plants were manufactured for Russia during World War II. The Navy acquired 14 that had been delivered at the end of the war. Three were later sent to Turkey, where they could be operated without alteration. Eight of the remaining 11 plants were leased to Mexico Light & Power Co late in 1949 to alleviate a power shortage there. The 50-cycle generator can be used in Mexico. The cars were returned to the U. S. last December.

Bureau of Yards and Docks also has two identical 10,000-kw mobile steam power plants built in 1941 to provide emergency power if Navy generating plants should become inoperative for any reason. Each of these is housed in six specially constructed railroad cars, and is a complete train except for the locomotive.

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Appointed to Ohio PUC

Robert L. Moulton, Galion, Ohio, has been named to the Ohio Public Utilities Commission for a term ending Jan. 31, 1957. Moulton, former state commerce director, succeeds Harold L. Mason, whose term expired.

YIELDS (%) — Operating Electric Utility Securities

Quality	Bonds			Preferred Stocks			Common Stocks		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
DATE									
1951									
June 7	2.91	2.95	3.09	4.03	4.25	4.62	5.63	6.33	7.33
May 31	2.89	2.94	3.06	4.02	4.24	4.63	5.64	6.36	7.22
END OF QTR.									
1st 1951	2.87	2.93	3.00	3.96	4.19	4.52	5.47	6.20	7.13
4th 1950	2.65	2.67	2.78	3.86	4.14	4.51	5.80	6.54	7.44
3rd 1950	2.66	2.57	2.76	3.81	4.08	4.46	5.70	6.54	7.25
2nd 1950	2.68	2.66	2.74	3.79	4.03	4.38	5.38	6.51	7.50

Data: Reis & Chandler, Inc.

OPS Following Old OPA Precedent in Intervening in Utility Rate Cases

The Office of Price Stabilization apparently has taken up where the wartime OPA left off as an important factor in utility service rate proceedings.

Last week OPS petitioned the California Public Utilities Commission for the right to intervene in hearings on the proposed increase in California Electric Power Co's rates. This action closely followed OPS intervention in Federal Power Commission proceedings on a proposed increase in natural gas rates on the Michigan-Wisconsin Pipe Line Co.

During World War II, OPA—with legal authority very similar to that given OPS by the Defense Production Act of 1950—intervened in dozens of utility rate proceedings. The price agency almost invariably fought proposed increases on the grounds they would prove inflationary. The result generally was to drag out rate cases before regulatory bodies.

In both the California Electric Power and Michigan-Wisconsin actions, OPS asked status as an intervenor for the purpose of submitting evidence on effects of the proposed increases in "the Federal government's price stabilization program".

The California commission will hold public hearings on the power rate matter at Riverside starting June 27.

OPS has no authority to set utility rates, but a utility must advise the price agency of a proposed increase and consent to OPS intervention before the proper regulatory body. This authority under Section 402 of the Defense Production Act applies only to rates on power services for resale.

But administration-supported proposals to amend the Defense Production Act include provisions to extend this authority to all utility rates, including retail. This would give OPS powers over utility rates approximately equal to those enjoyed by the old OPA.

OPS utility rate actions are initiated by its transportation, public utilities and fuel division, headed by Richard L. Bowditch. Electric and gas rates are the specific province of the division's public utilities branch, of which Frank M. Malone is chief.

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Florida Utility Tax OK'd; To Net $200,000 Yearly

A bill placing an inspection and regulation tax on public utilities, to pay the cost of regulating Florida utilities, has been passed and sent to the Governor for signature. The bill is expected to raise $200,000 a year.

The tax would be 2% on $1,000 of gross receipts up to $1,000,000, and $1 for each additional $1,000. The tax will be paid quarterly beginning July 1. The proceeds are to go to the State Railroad and Public Utilities Commission for its expense in administering the utility law.

FINANCIAL BRIEFS

Indianapolis Power & Light Co and Public Service Co of Indiana have asked Public Service Commission approval of an exchange of certain of their properties. They seek authorization to transfer 941 Public Service customers, mostly in Marion County, to Indianapolis Power & Light, and 879 Indianapolis Power & Light customers in Hendricks, Hamilton, and Putnam Counties to Public Service lines. The transfer would eliminate overlapping and duplication of facilities.

Ohio Power Co and its subsidiary, Union Electric Co, Newark, Ohio, have applied for Securities and Exchange Commission permission to dissolve Union Electric and transfer its properties to Ohio Edison.

Stockholders of Consumers Power Co, Mich., have ratified an increase in the authorized preferred stock of the company from 1 million to 1.5 million shares and an increase in common stock from 6 million to 10 million shares.

Stockholders of Kansas Power & Light Co have approved an increase in the authorized preferred stock from 200,000 to 400,000 shares. The company also was granted permission to increase the amount of unsecured debt from 10% to 15% of the total secured debt and the capital stock and surplus.

Electric Utility Financing—June 2-9

Company	Description	Amount of Offering (000)	Offering Price	Yield at Price to Public
Bonds				
Georgia Power	1st mtge, 3½%, 1981 new money	$20,000	101.871%	3.40%
Common Stock				
California-Oregon Power	250,000 sh new money	6,063	$24.25	6.60

SCHEDULED FOR FOLLOWING WEEK

Bonds—California-Oregon Power, 1st mtge, 1981 new money, $6 million; Public Service of N. H., 1st mtge, F, 1981 new money, $3 million.

Common Stock—General Public Utilities, 504,657 sh new money, $9 million; Kansas Power & Light, 256,842 sh new money, $4 million; Public Service of Colorado, 249,116 sh new money, $6 million.

Congress Urged to End Preference Power Sales

Congress is urged to abolish "preferences" now given to public agencies in the sale of electric power, in a resolution adopted at Seattle, Wash., by public utility commissioners of 11 Western states. Introduced by H. N. Beamer of Idaho, it asks that power generated at federal projects be made available to "all citizens and users without discrimination."

The preference policy discriminates against power users served by regulated utility companies in favor of public power groups, said Beamer, and "tends to force a change from private to public ownership of electric distribution facilities."

Beamer believes that "socialization of a large part of the electric industry in the West will inevitably result unless this trend is halted."

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Wood Poles for 230 Kv

Wood pole H-frames will be used to support 200 miles of 230-kv transmission lines to be built by Public Service Co of Indiana. This will be one of the few such installations in the country. The lines will run to Kokomo and Columbus from a 200,000-kw Wabash River station above Terre Haute, work on which has just begun.

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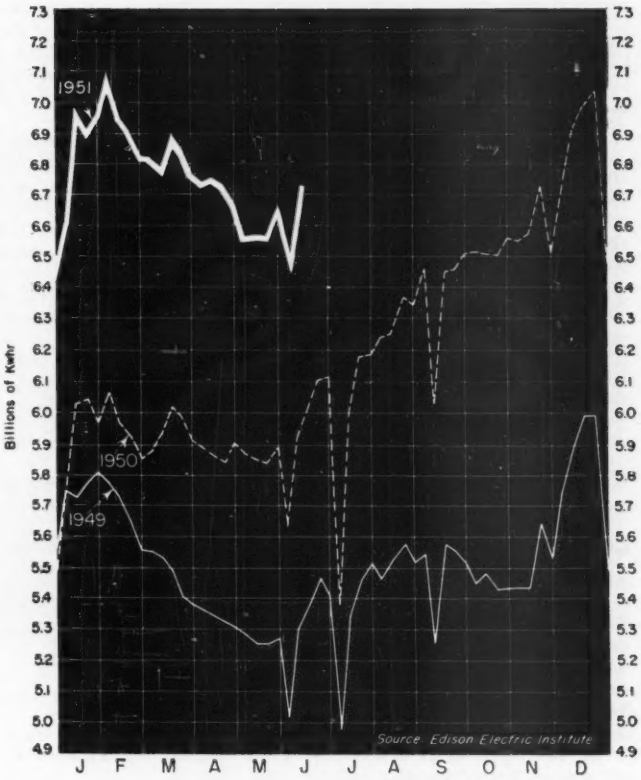
Pensions Upped to $100

Stockholders of the Southern Co have approved amendments to the pension plan which will increase the minimum monthly payment from $60 to $100. Alabama Power Co, Georgia Power Co, Gulf Power and Mississippi Power Co, all controlled by Southern, will be affected by the increase.



Output Week Ended June 9—6,733,662,000 Kwhr

Weekly Output, Millions Kwhr

1951		1950		1949	
June	9 6,734	June	10 5,921	June	11 5,300
June	2 6,445	June	3 5,632	June	4 5,018
May	26 6,653	May	27 5,894	May	28 5,270
May	19 6,559	May	20 5,845	May	21 5,255
May	12 6,567	May	13 5,864	May	14 5,527
May	5 6,560	May	6 5,868	May	7 5,284
Apr	28 6,674	Apr	29 5,902	Apr	30 5,304
Apr	21 6,730	Apr	22 5,846	Apr	23 5,326
Apr	14 6,747	Apr	15 5,863	Apr	16 5 343
Apr	7 6,736	Apr	8 5,898	Apr	9 5,360

Percent Change from Previous Year

	June 9	June 2	May 26
New England	+11.0	+10.3	+14.3
Mid-Atlantic	+12.6	+13.5	+13.1
Central Industrial	+11.3	+14.4	+12.9
West Central	+12.5	+12.5	+11.2
Southeast	+15.4	+14.2	+12.3
South Central	+24.6	+22.8	+17.7
Rocky Mountain	+14.9	+13.7	+11.1
Pacific Coast	+13.5	+14.0	+11.6
Total United States	+13.7	+14.4	+12.9

MEETINGS

Canadian Electric Association
Annual Convention, Algonquin Hotel, St. Andrews, New Brunswick, June 18-21.

American Society for Testing Materials
Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J., June 18-22.

Michigan Electric Light Association
Annual Convention, Machinac Island, Mich., June 24-27.

American Institute of Electric Engineers
Summer General Meeting, Royal York Hotel, Toronto, Canada, June 25-29; Pacific General Meeting, Multnomah Hotel, Portland, Ore., August 20-23; Fall General Meeting, Hotel Cleveland, Cleveland, Ohio, October 22-26.

Pacific Electronic Exhibit
Civic Auditorium, San Francisco, August 22-24.

Illuminating Engineering Society
National Technical Conference, Hotel Shoreham, Washington, D. C., August 27-30.

Northern California Electrical Bureau
Annual Exposition, Civic Auditorium, San Francisco, September 1-9.

Rocky Mountain Electrical League
Fall Convention, La Fonda Hotel, Santa Fe, N.M., September 9-12.

Public Information Program
Annual Workshop Conference, Edgewater Beach Hotel, Chicago, September 20-21.

American Society of Mechanical Engineers
Fall Meeting, Hotel Radisson, Minneapolis, Minn., September 25-28.

Iowa Utilities Association
Management Conference, Fort Des Moines Hotel, Des Moines, Iowa, October 1-2.

International Association of Electrical Inspectors
Eastern Section, Chalfonte-Haddon Hall, Atlantic City, N. J., October 1-3.

National Farm Electrification Conference
Annual Meeting, Hotel Gibson, Cincinnati, October 9-10.

Indiana Electric Association
Annual Convention, French Lick Springs Hotel, French Lick, Ind., October 10-12.

International Association of Electrical Leagues
Annual Conference, Roosevelt Hotel, New Orleans, October 10-13.

National Association of Railroad and Utilities Commissioners
Francis Marion Hotel, Charleston, S. C., October 16-19.

National Electronics Conference
Annual Conference, Edgewater Beach Hotel, Chicago, October 22-24.

American Standards Association
Annual Meeting, Waldorf-Astoria, New York, October 22-24.

WASHINGTON COMMENT

FISCHER BLACK

The crisis over allocation of materials for the power program finally came when a cut of 30% was announced for the third quarter of 1951. The seriousness of this problem has not only been recognized by the industry but also by those in Washington who are responsible for power system equipment.

C. B. McManus, former administrator of Depa, made the following statement concerning the situation:

"The Engine and Turbine Division and the Electrical Division of NPA receive the allotments for the manufacturers of major power equipment. Depa receives the allotments for the direct needs of electric utilities. The third quarter allotments are substantially below the quantities requested by both the NPA divisions and Depa.

"Three of the manufacturers of major power equipment have told us what will happen as a result of the sharp cuts in materials for the third quarter.

Cut of 900,000 Kilowatts

"Concerning turbines, the lost production is estimated to be 400,000 kilowatts for one company and 300,000 kilowatts for another. The third manufacturer will be short 64% on materials.

"On transformers, shipments by one company will be delayed from one to 14 months starting in August, 1951. Another will have to operate at half capacity and the third will be short 42% on materials.

"For switchgear, delays in deliveries for one company will start in July of this year and will range from two to 12 months. Delays for another company will start in August and will be from one to 13 months. The third manufacturer reports a deficiency of 28% in materials requested for switchgear.

"The delays in switchgear and transformers caused by these material cuts will interfere with scheduled 'start-up' dates for some generators to be delivered in the months immediately ahead.

"Providing materials for the manufacturers of major power equipment is the job of the Engine and Turbine Division and the Electrical Division of NPA, but it is Depa's job to document the entire power program so that they can get the materials they need.

"Both Depa and the two divisions in NPA are insisting that the power program must be maintained on schedule; that to let it slip, would interfere with essential defense production. The materials needed for scheduled production of equipment in the third quarter of 1951 must somehow be obtained."

Sutton Worries over Adequacy

Louis Sutton, speaking before the EEI Convention, had this to say about the situation. "If this order stands as now drawn, it will gravely jeopardize the adequacy of the nation's power supply next year and subsequently.

"So small a percentage of the industry's total requirements for steel and copper goes into the equipment and building of the generating stations themselves that it is to be hoped the control agencies will see their way clear to modify this order sufficiently to permit the manufacture of generating station equipment to proceed according to the conservative schedules of the industry's power experts."

The meetings of mobilization officials begun early last week should soon bring clarification of their problem. McManus has said that he will fight for more material for the power program to the bitter end. Undoubtedly Fairman will follow suit.

At this critical stage in the industry's expansion program it appears necessary for all groups, both manufacturers and utilities, to come forward with a strong protest. This recent reflection of the Washington attitude is merely an outward exposure of a hangover of the Harrison philosophy. Fortunately his influence is no longer present. It will now be necessary to convince the one who takes his place the program cannot be cut.

TECHNICAL NOTES

ARCHER E. KNOWLTON

Metallic conductivity is sensibly infinite at absolute zero; unfortunately no substance has been discovered with transition temperature (at which the phenomenon disappears) above –260C; all electrical engineering will be transformed if some other means than impracticable refrigeration is found to achieve the superconductivity.

Insulation life of a transformer should be extended as well as that of the oil if an oxygen inhibitor is used.

Weather permanent faults are twice as common on rural circuits for covered conductors as for bare ones.

Inhibiting of oil might well be a superfluity in sealed or tight transformer tanks.

Reservoirs, dams, and waterways constitute about 60% of the average outlay for U. S. hydro plants of 50 Mw with heads up to 500 feet.

Leather belts and rubber protective apparatus should be kept away from supplementary heaters provided in trucks in cold weather to keep line crews warm.

Stainless steel (18 Cr, 8 Ni) fence fabrics (13 ga) after 10 years industrial atmosphere exposure showed brilliance, no corrosion. Cost per linear foot was 23% more than aluminum (9 ga) and 85% more than galvanized steel (1.2 oz).

Dormant (basal bark and stump) treatment would, if established as broadly successful, put kill of brush and small trees on a year-round basis.

Acoustic muffling of jet engine roar is being accomplished with a cell lining of insulating firebrick.

Nodular iron is a new development offered for use in high-pressure, highly-stressed machinery; tensile strength exceeds 90,000 psi.

Set for the Strain

Power supply will be adequate; tax burden is heavy; more effort is needed to combat socialization of the industry

We do not yet know what new large defense loads may have to be met, nor in what particular areas they may fall, nor do we yet know how seriously our expansion plans may be hampered by delays in obtaining materials and equipment. But we do know that any material shortages that may hold back our own expansion program will likewise retard the building plans of most of our customers and prospective customers. When increased power demand falls on our system, we know from previous experience we will have available increased capability with which to fill it.

We have been criticized in some governmental quarters for planning too ambitiously, for not being willing to curtail our service as other industries have to curtail theirs in the interest of national defense.

Dependence of all segments of American life upon electric power is such that we must exert our best endeavors to supply increased power demands, and we have done and will continue to do that. Decisions of the Federal government in the interest of national defense have imposed upon us a grave responsibility to use our best engineering talents, resources, and business judgment to hold down our construction requirements to the bare limits of safe operating margins.

Still other elements of government have been clamoring that we have been moving so conservatively in increasing generation capacity that power shortages will develop all over the nation. Neither the comprehensive and authoritative Ninth Semi-Annual Power Survey nor this speech of mine will stop persons, particularly those with axes to grind, from continuing to glimpse or smell a power shortage in the offing. But our careful and complete surveys tell us where we are and how fast we should move. They put us in a position to give authoritative advice on power supply to those who are thoughtful enough to turn to informed and responsible sources for information.

LOUIS V. SUTTON
President
Carolina Power & Light Co

EEI's retiring president, Louis V. Sutton joined Carolina Power & Light Co, of which he is now president, in 1912, starting as a statistician. In 1924 he went to Arkansas Central Power Co as assistant general manager and then moved on to Jackson, Miss., to help organize Mississippi Power & Light Co. He served the latter as vice-president and general manager. Sutton returned to Carolina P & L in 1933 as president. He has been president of SEE, director of NAEC and helped establish PIP.

Financing Expansion . . . Nearly four years ago the business-managed electric light and power companies of the nation, then constituting a $12 billion industry, announced a $5 billion expansion program. This was widely recognized, particularly in financial circles, as a huge undertaking for any one industry and a notable example of the American free enterprise system in operation. That expansion program soon became 6, then 7, then 9, then 12, and now $15 billion. Part of this change to $15 billion is due to the passing of time, because this is a growth industry in a growing country. Each year adds increased construction requirements; but this program represents much more than normal growth. It has been abnormal growth. It should be recognized, too, that part of the dollar increase in the program represents inflationary factors.

Ours is a regulated industry. The companies are held rather closely to an established rate of return and to a desired ratio between debt and equity capital. New equity capital must be raised by financing.

Taxation Picture . . . Taxes now take 23% of every dollar of income of the electric utility companies. Last year corporate income taxes were increased from 38 to 47%. The new tax bill before Congress would increase this percentage still further.

The electric utility companies, and in the last analysis 80% of the American people who are their customers, are one of the most heavily taxed elements in the nation's entire economy. Further tax increases will gravely threaten their progress. Tax discrimination against one community in favor of another by a Federal government dedicated to equal justice for all is unconscionable. It, therefore, devolves upon every one of us to be sure that our employees, our stockholders, and our customers continue to be fully informed on these facts so that in the democratic process the unfairness will be corrected and the threat to our sound growth and development will be removed. If we do not point out this danger and this unfairness, who is going to do it for us? It is not a one-man job; it is an educational task for every one of us.

Rates . . . The industry has an enviable record of keeping prices down

in the face of rising costs. The electricity component of the consumer price index as of December 30, 1950, was only 90.3% of the 1935-39 base, as compared with 178.4% for the total of all items. For residential service, the average revenue per kw decreased from 3.09 cents in 1947 to 2.88 cents in 1950. This decrease in the face of higher prices generally was due largely to increased use under our promotional rates. Since 1947 there have been 231 rate increase actions by 144 companies. Of the 231 requests, 202 were granted, 21 are still pending, and 8 were denied or withdrawn. Of the 21 pending cases, 14 were filed in 1950 and 7 in 1951. The cumulative total increase since 1947 is between 2 and 2½% of the gross revenue.

During the same period (1947 to date), governmental agencies, which account for only 15% of the kwhr sales, have made 617 increases.

The record makes it clear that increases have been requested only when needed, and that, in general, commissions have realized their obligation to the public and the defense effort to keep the industry in a healthy financial condition.

Rural Electrification . . . The job of building power lines to reach occupied farms and rural non-farm establishments has virtually caught up with the present settlement of America. Of course, America is growing and we will always be extending rural lines to serve rural growth, but by the end of this year, electricity will be available to all but about 5% of the occupied farms of America and to all but about 3% of the occupied rural dwellings. Many of the remaining farms are very widely scattered.

With one big task nearing its end, the big job ahead of us in the rural areas is to make electricity do still more for the farmer. Electricity is tremendously important to our farm customers. It will become very much more so in the years immediately ahead. It is greatly in our interest as suppliers of electric service to help save the farmer's time, to lift the work load from his shoulders, to increase his production and his profit, to lighten the household tasks of his wife, and to brighten his home. It is the way for us to earn a fair return on the expensive facilities we have built and must continue to build and improve in order to give him the kind of service his new farming methods will seriously require.

Government Intrusion . . . I am revealing no secret to this audience when I say that one of the passionate projects of the New Deal and the Fair Deal is the socialization of the power industry. For 18 years there has been no let-up in their program. Little has been overlooked in the drafting and enactment of legislation, the appointment of "socially minded" administrators, in the development of administrative regulations, and in the management by the government of court proceedings designed to contest the legality and constitutionality of legislative and administrative acts to make certain that the program of the Administration would not be arrested or seriously hindered.

Failure of efforts so far to socialize the industry in the face of huge appropriations, of destructive tax discrimination, and the other maneuvers of a powerful bureaucracy can be credited, in my mind, to two principal factors: first, the inveterate dislike—which is growing—of the American people for socialism or government in business; second, the inherent strength of free enterprise, the youthful vigor and the fundamental soundness of the electric business, and the generally high character and ability of the many company organizations serving the communities throughout the nation. A third factor is now beginning to exert itself with force—inflation. The shrinking value of the American dollar, in no small part attributed to lavish Federal expenditures for dubious benefits, is becoming painfully plain to the American consumer.

Telling the Public . . . In the face of the acknowledged need for a more aggressive and thorough public relations program, it is surprising to see how little effort we are making. A considerable proportion of the people believe that the electric utility industry cannot provide the necessary capacity to implement the defense program, and therefore the government should construct generating plants. During the present emergency, as was the case during World War II, the press is being flooded with releases designed to prove the imminence and even existence of a power shortage.

I do not have to tell you that the electric utility industry is a miserly advertiser. During 1950 our industry spent through the five major advertising media a total of $16 million. When salaries and other advertising expenses are added, the figure is increased to $25 million. According to the February 23 issue of "Printers' Ink," our industry's advertising program (ECAP) ranked 98th in a list of 100 leading national advertisers in 1950. The three leading soap companies in this country spent during the same year $52.5 million in media advertising and $77 million total.

Industry Associations . . . In addition to EEI, we have in the electric utility industry three major industry associations: The Electric Companies Advertising Program; National Association of Electric Companies; and the Public Information Program. They are all doing good work, but they are not supported by the industry as they should be. The EEI represents 80 to 85% of our industry, with total dues of around $800,000. ECAP has the support of 60% of the industry, with an income of around $1.4 million. The NAEC has about two-thirds of the industry, with an income of around $400,000; and PIP, which has only recently been organized by ten companies, now has 70 member companies, with an income of about $300,000. This is a total of slightly less than $3 million. For the individual companies supporting all four, the cost is about 0.1% of total gross revenues, or about 1 mill out of each dollar. For the industry as a whole, with gross revenues for 1950 of $4,500 million excluding inter-company sales, the cost is two-thirds of a mill per dollar of gross revenue, or around 0.06%.

The budgets of these four associations should be increased to at least $4 million a year, with ECAP using half of it. I am convinced the people will support the utility industry against unfair encroachment if we can give them the facts.

Utility Financing Needed for Defense

In the next three years $7 billion will be required to build facilities to meet the estimated future demand for power

The single most important job before the electric power and light industry is to create the facilities required to serve estimated future demands for electricity. Despite its size, I have no doubt that your enormous program of expansion can be and will be financed. In truth the program *must* be financed and completed, because without necessary facilities for production, transmission, and distribution of electricity, programs for the development of production facilities for defense would come to naught.

In the years 1948, 1949, and 1950 you did a $6 billion job of expanding, and it was well done. On the basis of this past experience, it may be estimated that one-third of the $7 billion now needed will be generated internally by your industry. Two-thirds, or approximately $4,700 million, will come from investors. This two-thirds will be divided about $3 billion from the sale of debt securities, approximately $700 million from the proceeds of preferred stock, and very close to $1 billion from the sale of common.

Sale of debt securities will present no unusual or particularly difficult problems. Present indications are that rent for money will be approximately ½ of 1% higher than was paid in 1948, 1949, and 1950. At these new levels, I expect that you will find important groups of investors more active purchasers of your bonds than they were in the past. Small and medium size insurance companies, fraternal societies, colleges, hospitals, and pension funds, which elected to retain cash or invest in government bonds when return on your long-term bonds was below 3%, will again be in the market for your bonds. Private placements or direct placements with small groups of large insurance firms may be less frequent.

Somewhat higher dividend rates which investors will demand on preferred stock will also open new sources of capital. Perhaps a range of from 4.25% to 5% will be the area of cost in which most of you will find that investors will take your preferred stock. The temptation to raise disproportionate amounts of new capital during the past three years by means of less costly debt financing, which is the easier thing to do, was resisted. I urge you to continue to resist it—despite tax inducements.

On the subject of rate increases, I believe I speak for the broad cross section of informed investors when I tell you that from the standpoint of the common stockholder your rates, generally speaking, are too low.

In the three years ended January 31, 1951, net investment in electric utility plants increased by about $4,250 million dollars, or 39%. In this same period net electric operating revenues increased by about $195 million, or about 26%. The incremental return on the incremental investment comes to 4.6%. While these figures are approximate, it seems undeniable that the electric utility industry has not been obtaining a sufficient return on its additional investment. In the latest tax bill Congress recognized 6% as the rate utilities should earn. It is important for you to follow this up on the level of state and city regulatory bodies. Normal and completely understandable distaste for attacking problems incident to obtaining rate increases must be overcome.

Dividend policies should be arrived at against the basic philosophy that you will be able to maintain the dividend rate even in times of moderately bad general business. Dividend policies should not be particularly related to your construction programs.

Managements of electric utility companies would be well advised to put their best foot forward on this dividend matter in competition to attract such investors. Generally speaking your common stock financing will be facilitated by paying out as cash dividends up to perhaps 80% of available earnings.

You have done an exceedingly good job of educating security dealers, particularly those located in areas in which you operate, so that they are in a position intelligently to discuss your business and your securities with their customers—the investors. Looking forward to the task you have before you, it continues to be important for you to tell your story over and over again at each opportunity.

GEORGE D. WOODS
Chairman of the Board of Directors
The First Boston Corp

Closely identified with the problems of utility financing for more than 30 years, George D. Woods was named chairman of the board of The First Boston Corp last month. He started with the old investment security firm of Harris Forbes & Co in New York in 1918. When the company was purchased by Chase Securities Corp in 1931-2, Woods became a vice president. A few years later he and several associates joined with the security affiliate of the First National Bank of Boston and launched The First Boston Corp.

Hold Dike Against Nationalization

TVA and BPA are examples of business too big for private enterprise. But further punctures of the dam against Federal penetraters should be plugged

The electric power industry's tremendous recent growth is an open record. Its tremendous role in the industrial picture of America is hardly less evident. But its future status, whether as a private industry or a government activity, continues to haunt your dreams. I am no soothsayer. But I shall set out a few propositions that seem to me to have a bearing on the possible outcome.

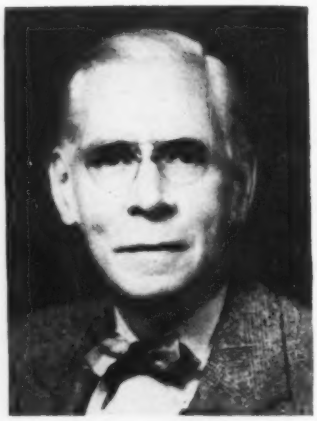
First, I think we have to recognize that hydroelectric development is tied in with navigation, agriculture, forestry, and several lesser matters in ways that make collaborative plans and multi-lateral settlements socially necessary. They are demanded for the long-run interest of the economy. The electric power industry must be willing to study its problems and evolve its programs in that context.

Two, I do not believe that this calls for valley authorities from the Mississippi to the Merrimac. Private enterprisers can and I believe, with the present state of social consciousness of company executives, would adapt their plans of power development to any reasonable program of multi-purpose resource development that government agencies show justification for. And the need to reconcile the social hopefulness of the public official with operating realities as seen by the men who have to face a balance sheet is bound to reduce waste and raise efficiency.

Third, for all ordinary projects, the managerial talents and financial resources of private industry will suffice, as is shown by the enormous private expansion of recent years.

Fourth, there have been times, and may be times again, when private power companies did not "think big enough" or could not marshall enough money or courage in risk-taking to do what the country needed or was about to need power-wise.

I see TVA as an illustration of one such situation. If the Federal government had not become a pacemaker in that situation, I do not believe the power industry's contribution to the industrial quickening of a somewhat lagging section would have been so adequate or so prompt as it has in fact become. Nor, without this vigorous pace-making, would the rates for current have been adjusted fast enough to provide an increasing market for power and equipment as has developed in this area.



EDWIN G. NOURSE
Past Chairman
President's Council of Economic Advisers

First chairman of President Truman's Council of Economic Advisers, Edwin G. Nourse has devoted his lifetime to the study and teaching of economics. For fifteen years he taught economics at the University of Pennsylvania and at colleges in South Dakota, Arkansas, and Iowa. Then he joined the Brookings Institute in Washington, D. C., and turned his energies toward research work. He served as vice president of Brookings for some years and headed the council of Economic Advisers from 1946 to 1949.

To my mind, TVA is an invaluable experiment in the laboratory of free enterprise. It has shown us certain mistakes which should not be made again elsewhere by anyone, public or private. It has shown us a great deal about how separate power units under private management could coordinate their operations with each other under a plan openly arrived at and approved by the proper agencies of the government.

Such a coordinated plan would be adjusted to such considerations of transportation, soil conservation, forest development and wild-life protection as are the concern of other industries and governmental agencies.

In time, TVA might be like the suture used by the surgeon to hold muscles or membranes together until they can grow new tissue. Meanwhile, the suture itself is absorbed and disappears.

About public and private enterprise in the power industry of the Columbia Valley and the "facilitating" of the creation of that great resource, I see no excuse for government trying to monopolize its use. Perhaps absolute limitation to "sale at the bus-bar" is not practicable. Perhaps a skeleton system of high-tension wholesale distribution has to be furnished by the Federal government, though the technical ability and financial willingness of private power companies in this and other regions make that seem very doubtful. But whatever the point of sale, the "common carrier" principle should govern. A free market means selling on the same terms to whomever wants the service.

It ill befits a government that is ostentatiously attacking private monopoly to seek in the twilight to build a public monopoly of much greater size. Furthermore, the present is a time when it is peculiary improper to use manpower and materials to construct duplicating facilities.

Future Loads Will Absorb New Capacity

Chart your growth; tell us what capacity you will need; and the electrical manufacturing industry will design, build, and deliver it

The electrical industry faces problems which fall into short-range and long-range areas. The immediate short-range problems are those of getting men, machines, and materials; of meeting the power load; of manifold regulations; of wondering whether some people are going to use this emergency, as they did the last one, as an excuse for expansion of government in business. The long-range problems are how to meet permanently higher fixed costs and break-even points when the emergency is over; whether the industry has committed itself too far ahead; and who in the future will use all the new generating capacity that has been built.

You will have a 50% increase in capacity in the next four years. You must assume, of course, that your suppliers will be able to meet schedules on the 26 million kw you now have on order—and will be able to meet any further demands you may make. But it is, I feel, a sound assumption that you will get what you have ordered and, in so far as can be seen today, close to scheduled delivery dates.

In production of generators, the country's manufacturers had the capacity to turn out approximately 3½ million kw annually before World War II. Scheduled production is nearly 9 million kw for 1951 and 12 million kw for 1952. Electrical manufacturers also have capacity to build 47 million kva in power transformers, with similar increases for switchgear, condensers, and motors. To the extent that I may speak for the manufacturers, let me assure you that we are extending ourselfs to the limit. Certain metals, including copper, chromium, cobalt, nickel, and aluminum, are in tight supply. The electrical manufacturers have the problem of securing steel. There are shortages of chemicals, resins, asbestos cloth, and rubber gaskets. Valuable time has been lost in labor disputes. We must follow the orders of the National Production Authority on the use of critical materials and in producing and delivering the apparatus you have ordered.

JOHN K. HODNETTE
Vice President
Westinghouse Electric Corp

John K. Hodnette started with Westinghouse Electric Corp in 1923 and fifteen years later received the company's highest award, the "Order of Merit." A prolific inventor, Hodnette distinguished himself by developing a completely self-protected transformer. For this achievement he received the NAM's "Modern Pioneer Award." He was made manager of transformer engineering for Westinghouse in 1940, vice president and manager of the Transformer Division in 1948, and general manager of the Industrial Products Division in 1949.

Despite these complications, the electrical manufacturing industry this year will equal or exceed last year's production figures in most classes of power apparatus. I want to go on record as saying, "Chart your growth, tell us what you need, and the electrical manufacturers will design, build, and deliver it."

One serious problem is the shortage of trained engineers. In the past two years about 100,000 engineers of all types have been graduated, and rapidly and easily assimilated by industry. In 1951, we will have about 32,000 engineering graduates. We know this is not enough. As we look further ahead, the picture gets worse. The U. S. Office of Education estimates that only 25,000 engineers will graduate in 1952, and 20,000 in 1953. In 1954 there will be a maximum of 17,000 engineering graduates.

Providing the incentive for young men to become engineers is only part of the solution. Another is proving to Washington, to the populace in general, to the newspaper columnists, and to the young engineer himself, that industry needs him as much as anybody.

It is my "educated guess" that any pessimism over the long-range prospects of American industry is unrealistic. We expect your industry to grow at an average rate of something like 6% per year for the next 15 years. All the evidence points to the conclusion that the American economy of 5, 10 and 15 years from now will need and intensively use these new service facilities. There is no indication that we will experience saturation of the American market, or run into extended periods in which our full productive capacity will not be needed to meet the demand.

As long as we have the confidence, the vision, and commercial sense, ours is an industry with unlimited potential. And here is the area in which lies the answer to the long-range problems of the higher break-even point and the poorer profit ratio. When this emergency ends, or perhaps when military pipelines are filled a year or two from now, the marketing departments of our industries must be prepared to give us an enormous, low-cost production of customers on a scale far greater than anything achieved up to the present time.

Preference Clauses Lead to Perdition

Perversion of the Flood Control Act provisions is the keystone of the public power arch

I would not call Secretary Chapman or Douglas Wright or Ben Creim, for example, either a Communist, or a Fellow Traveler, or even a Socialist, because any such accusation on my part would be without proof and therefore would be both reckless and irresponsible. But I maintain that the persistent and determined efforts of these and similarly minded gentlemen to promote public power have already done irreparable damage; that the road upon which their feet are set is the road to socialism; and that, if we may judge by the experience of our British cousins, the road to socialism is the path which surely leads to perdition.

I am going to address myself particularly to what I think most of you know as the "preference clause," a device which, as used by our Interior Department friends to accomplish their purposes, is both extra-legal and Machiavellian. This device is not contemplated by the legislation under which our adversaries purport to act and, if you will forgive me for being a bit rhetorical, it definitely is indecent unguent spread upon the path to perdition.

Preference clauses are not something new. As long ago as 1906 the Secretary of the Interior was authorized to give preference to "municipal purposes" in leasing power developed at reclamation projects. There are similar provisions in a large number of the Federal enactments in this field. Section 5 of the Flood Control Act of 1944 is typical.

It uses this language: Disposition of electric energy "in such manner as to encourage the most widespread use thereof at the lowest possible rates to consumers consistent with sound business principles" and rate schedules "drawn having regard to the recovery . . . of the cost of producing and transmitting such electric energy." There you have the basic congressional intent. Then comes what obviously is a proviso granting a preference in the sale of such electric energy "to public bodies and cooperatives." Kindly observe, too, that such energy is to be made "available in wholesale quantities for sale on fair and reasonable terms and conditions to facilities owned by the Federal Government, public bodies, cooperatives, and privately-owned companies."

A. J. G. PRIEST
Vice Chairman
Section of Public Utility Law
American Bar Assn

A. J. G. Priest, an attorney who has frequently appeared before the Securities and Exchange Commission, the Federal Power Commission and state regulatory agencies, is vice-chairman of the Section of Public Utility Law of the American Bar Association. He served Idaho Power Co from 1922 to 1926 as attorney and secretary, and Electric Bond & Share Co as attorney for nine years. Following this he became a member of the law firm of Reid & Murphy and in 1937 a member of the firm of Reid & Priest.

Mr. Ickes has rare imaginative gifts, and perhaps Mr. Chapman does too, but I think it would require a greater talent for fantasy than either of them possesses to read into Section 5 of the Flood Control Act any congressional intent that agents or representatives of the Department of the Interior should advise and assist public bodies and cooperatives who are potential purchasers of electric energy generated at multi-purpose dams in "acquiring, operating and maintaining" public power distribution systems. In effect, Secretary Ickes said to his Southwestern Power Administrator, and Secretary Chapman continues to say, "Do everything you can to convert investor-owned, tax-paying utility property into government-owned, tax-eating utility property."

I challenge the Department of the Interior to find in the preference clause any meaning except this: If, when the Department is ready to dispose of power from a particular multi-purpose project, there are two potential purchasers, one a public body and the other an investor-owned utility, making equally satisfactory offers, the offer of the public body will be accepted. Congress very definitely has not instructed the Department of the Interior to decline to furnish power to an investor-owned utility which is able and willing to purchase such power at the Government's bus bar and then proceed to spend the taxpayers' money to construct transmission facilities for the purpose of carrying that very power substantial distances to preference customers.

The preference clauses clearly are the keystone of the public power arch. Indeed, the whole program of the Department of the Interior, and its allies among the public utility district brethren, the promoters of grandiose public power schemes for private profit, sundry other Federal agencies, and the various peddlers of tax-free bonds for the particular benefit of persons in high-income brackets, depends upon these preference provisions which discriminate so outrageously against four-fifths of the people.

The Electrified Farmstead

Design and planning are needed for full realization of the values of farm electrification. Mechanization of chores is the principal requirement

What we need to do to make farm electrification the effective servant of agriculture it should be is remodel the entire structure, that is, the entire farmstead layout, together with the equipment and devices in and around the buildings to reduce time spent doing chore labor.

Livestock chores account for over 55% of all the farm labor in Wisconsin, where dairy farming is the major farm enterprise. About 25% is used for crop production and 20% for miscellaneous chores, such as repairing buildings, fences, and machinery, business trips to town, etc. On some farms as much as 65% to 70% of the labor is used for livestock chores. A 1947 survey conducted in a grain-growing area of Illinois revealed that even with this type of farming, 36% of the farm labor was used for livestock chores and only 33% for crop production. The balance of 31% is used for miscellaneous chores. Cornell University reports that specialized dairymen in New York State spend 58% of their time doing livestock chores.

To make a thorough study of farmstead electrification, the Wisconsin Electric Research Farm was established in 1946 by the Agricultural Experiment Station of the University of Wisconsin with funds supplied by the Wisconsin Utilities Association. The object of this farm is to find better ways of applying electric service to the dairy farmstead.

The research farm used 44,800 kwhr in 1950, which would cost $900 to $1,200 at Wisconsin farm rates. What did the farmer get in return for this expenditure? Here are some of the benefits:

The silo unloader reduced the time of getting down silage for the 24-cow herd from about 10 min to about 10 sec.

Feeding silage to the cows with a new type of dispensing cart, as compared to the conventional cart and fork method, reduced the time from about 14 min to about 10 min.

Cleaning the barn with a barn cleaner, as compared to driving through the barn with the manure spreader reduced the time from 22 min to a little over 5 min.

Cleaning cows has been almost entirely eliminated.

Water is piped under pressure to the cows, hogs, and chickens, to eliminate all carrying of water by hand.

There is very little hand-handling of feed.

FLOYD W. DUFFEE
Chairman
Dept of Agricultural Engineering
University of Wisconsin

Author and professor, Floyd W. Duffee has been active in the field of farm electrification for the past 30 years. Since 1937 he has been chairman of the Agricultural Engineering Department of the University of Wisconsin. He was born and raised on a farm in Indiana. After graduating from Ohio State University, Duffee became an instructor at Connecticut Agricultural College and in 1918 went to the University of Wisconsin. He has written numerous articles for farm magazines.

There is no moving of portable hog houses. The electrical equipment in the central hog house is always ready for operation.

All that is needed to change the hogs from one pasture to another is to open one gate and close another, jobs done once a year.

The heat lamps used for brooding pigs will save an average of one pig per litter in cold weather.

Artificial lighting in the laying house increases egg production when egg prices are highest.

The shop makes it easy to keep all machinery in efficient working condition all the time.

The milking machine together with "fast milking" which requires the use of hot water reduces milking time.

The milk house with its milk cooler helps secure a premium price for milk. The water heater, connected to an "off peak" meter, with washing vats, provides the main essentials for keeping milking utensils clean.

The feed plant saves a substantial amount of cash outlay for feed grinding and mixing, as well as the handling.

This bill for electricity also includes the current for all the comforts, labor saving conveniences, and food storage equipment for the modern home on the farm.

The enthusiastic support which Wisconsin utilities continue to give our research program indicates its value to them. Their recognition that its value will increase as years go by has been demonstrated. To meet the problems that arise in other sections under typically different conditions, state or regional organizations of the electrical industry might well cooperate with their experiment stations in setting up and sponsoring similar studies. They could hardly render a more far-sighted and progressive service to their farm customers. In the long run they should be well repaid in the extended use of power.

Power Supply for Defense

Utilities can facilitate adequate provision for their needs by close cooperation with Depa, asking only for essentials and asking early

In April 1951, approximately 27 million kw were scheduled for installation in 1951, '52, and '53. The expansion was 17 million kw before Korea and 27 million kw after Korea. This means that approximately 10 million kw of additional generating capacity have been scheduled in 1951, '52, and '53 over and above normal expansion as a result of the defense program.

We now expect to have by the end of 1951 the same total load in this country that a year ago we expected to have by 1953. And by 1953, we expect to have at least 12 million kw more than we expected in our planning before Korea.

Keeping the power program on schedule should be, and I think will be, the greatest concern for all of us over the next few years. The greatest single factor will be the availability of materials.

The allotments of aluminum, copper, and steel have recently been made for the third quarter of this year. They are substantially below the quantities requested.

Three of the manufacturers of major power equipment have told us what will happen as a result of the sharp cuts in materials for the third quarter.

Concerning turbines, the lost production is estimated to be 400,000 kw for one company and 300,000 kw for another. The third manufacturer will be short 64% on materials.

On transformers, shipments by one company will be delayed from 1 to 14 months starting in August, 1951. Another will have to operate at half capacity and the third will be short 42% on materials.

For switchgear, delays in deliveries for one company will start in July of this year and will range from 2 to 12 months. Delays for another company will start in August and will be from 1 to 13 months. The third manufacturer reports a deficiency of 28% in materials request for switchgear.

CLIFFORD B. McMANUS
Defense Electric Power Administrator

In December 1950, Clifford B. McManus resigned his post as president of Georgia Power Co to take on the job of Defense Electric Power Administrator. At that time he also became chairman of Georgia Power's newly created executive committee. With Georgia Power since 1927, McManus first served as superintendent of district operation, then operating manager. In 1946 he was elected vice president and director of operations. A year later he was named president, assuming a similar post with Georgia Power's parent company, the Southern Co, in 1949. Recently elected president of Southeastern Electric Exchange, McManus has indicated he will resign his Depa post when he takes office.

For the direct requirements of electric utilities, Depa has received 25 million lb of aluminum for the third quarter, compared with 49 million for the second. Our copper allotment is 75 million lb for the third quarter, compared with 92 million in the second. Our steel allotment is 90,000 tons a month, which is the same allotment as was given us for May and June.

One of the things which has handicapped us in getting sufficient materials for the third quarter is the slowness with which utilities applied DO's in the second quarter. Because these DO's did not reach the mills as quickly as they might have, the assumption was made in Washington that the utilities did not need all of the material they had asked for. This was not true, but it indicates the need for using priority assistance as promptly as possible.

There are two special points which I would like to call to your attention. The first is the necessity for all of us to have the overall view of the defense program; the second is the responsibility which all of us have to represent adequately the electric power industry in this country.

The two ideas are closely connected. We do not want to undersell or oversell our industry. We do not want to secure too much, use unwisely, or get too soon, the critical materials on which our defense effort depends. Neither do we want to fall down on the specific job which has been assigned to us in the defense program: namely, to have power ready when and where it is needed.

It is our individual responsibility to organize our activities so that as much time as possible will be allowed for increases in the production of critical materials to take place. This means the postponement of all unnecessary projects. It means that we must effect all possible economies in design and installation and closely coordinate construction with actual electric power requirements.

We are headed into a period when materials, equipment, and tempers are going to be short. We will need to be long on performance, productivity, and public relations.

Report on Water Resources Policy

Propaganda is guiding public thinking into the belief that private enterprise cannot develop needed hydro sites to meet power demands

The fundamental proposal of the President's Water Resources Policy Commission is that control of virtually all of the waters of the land be taken over by authorities to be set up by the Congress. They would operate by major river drainage basins and would be vested with vast powers over water development in particular and over industrial development indirectly. Their prime objective would be the production of hydroelectric energy and should the plans be carried through in broad scope, these governmental units would act to impede the workings of our free enterprise system to a degree today unsuspected.

It is stated in several places in the report that the development of water resources by the proposed regional agencies should be consistent with sound business principles. We can be forgiven if we smile at such naive remarks.

Conceding that generally speaking, the potential hydro possibilities should be harnessed and put to beneficial use, it seems to me the taxpayers can find consistent fault with the thought of the commission that all power sites should be developed by governmental agencies, with capital investments financed by the Federal Treasury. Public thinking is being guided by propaganda into a belief that private enterprise will not or cannot build the plants to meet the demands for more and more power. The hard facts in this particular instance dispute such representations.

I would not have you believe that because disagreement is voiced here with the report under discussion, in matters having to do with added governmental controls over power development, I would condemn the report out of hand. Most certainly I do not. I heartily concur with the recommendations for basin-wide studies and programs, but I think more emphasis should have been placed on state and local authoritative cooperation.

LESLIE A. MILLER
Former Governor of Wyoming

Ex-Governor of Wyoming, Leslie A. Miller has devoted a good part of his years to public service. He served several sessions in Wyoming's legislature and six years in the 1930's at the executive mansion. During World War II he was regional director at Denver for the War Production Board. More recently he was chairman of the Natural Resources Task Force of the Hoover Commission in 1948 and 1949. His business career has been concerned mainly with the wholesale and retail distrbution of petroleum products.

The suggestion that concrete participation by local governmental units in the financing of public projects be required, if carried into consistent effect, would be a powerful deterrent to unsound promotions. Moreover the recommendations that the direct beneficiaries of Federally financed projects be required to reimburse the Treasury for capital advanced is sound thinking. Which leads me to voice a thought growing out of the habit of mind so many of our people have fallen into toward public treasuries.

It has been pointed out quite forcibly by some critics, and justifiably so, that while the report is ably written and well documented in many particulars, it failed to adequately recognize the many sound recommendations made to the commission by technical experts both in and out of government. Be that as it may, it is a cold hard fact facing the men involved in management of this industry that the Commission was guided in its thinking by a membership majority which was predominantly public-power minded. In such circumstances, it was a foregone conclusion that the report would be slanted against the further growth of private enterprise in the field of power production. What then is the situation with which you are called upon to deal?

The report was submitted to the President and we understand work is under way on proposed legislation to implement the Commission's recommendations. The issue then is joined. You will defend the right of free enterprise to expand the manufacture and distribution of electric power by privately owned and managed concerns. You will not seek monopoly. You will give conscientious concern to the public good and, in doing so, you will gladly cooperate in establishing fair and equitable rates by regulatory bodies. You will not strive for undue advantage in any direction in the broad field of electric power production.

You will, in these circumstances, present to your representatives in Congress a case against repressive legislation which must appeal. You will be fighting for principle in your determination to protect the system of freedom of opportunity which has made America great and strong—the destruction of that system in your industry would make attack upon other industries easier to the enemy which is knocking at the door of American leadership.

We Have the Key to Peace

Our key to victory and peace is found in our Declaration of Independence. To win quickly we must stimulate understanding of basic American principle

We are at war. We have been engaged in this war for many years and we shall be involved in it for years to come. But this particular war is not with Russia nor with any actual or potential combination of foreign nations. The war which is sapping our resources and threatening our existence as a free and prosperous people is a deadly conflict of ideas. It is a war for the subjugation and capture of the American mind and particularly of the minds of those young people of America to whom the future of our country belongs. We are losing this war precisely because we have been deliberately confused concerning actual issues of the war and the precise location of the important fields of conflict.

It is not these physical and forceful frontal attacks by the Iron Curtain countries that threaten our national life. It is not the Russian aggressions but the Communist professions that have penetrated our defense lines and enervated our effective resistance to the enemy. While we fight the fires of Communist aggressions abroad, we have made the mistake of fanning the flames of Communist professions at home. It is the growing strength of the Communist professions here in the United States that will defeat us, if and when we are defeated.

The Communists have no stomach for a strictly military conflict with the United States. They shrewdly observe that all our potential strength is military and that all national consciousness is bound up with physical and geographical defenses. They likewise sense the now open secret that our great American ideology has lost its appeal for the great majority of our people and particularly for our youth. As a nation and as individuals, our instincts are now for mere "survival," for "security," for holding what we have, with no general understanding of how we obtained these blessings, or how they may yet be multiplied a thousandfold in future years.

CLARENCE MANION
College of Law
University of Notre Dame

Clarence Manion, author of the current book, "Key to Peace," is a professor and practitioner of law. He is dean of the University of Notre Dame's law department and a partner in the law firm of Doran & Manion in South Bend. He began teaching history at Notre Dame in 1919, studying law while he was there. Admitted to the Indiana bar in 1922 he practiced law for three years in Evansville. Returning to the University in 1925 he became a professor of constitutional law. He has written several books on liberty.

While we are in this unfortunate and defeatist state of mind we can never hope to win the ideological war which we are now waging with the Communists. To win quickly, decisively and permanently we must stimulate a renewed understanding of basic American principle and a revival of faith in the ability of that principle to conquer the mind of all mankind. Our key to victory and peace is to be found in the words spoken eloquently and officially with the first breath of the new life of the American Republic —The Declaration of Independence:

"We hold these truths to be self-evident that all men are created equal; that they are endowed by their Creator with certain unalienable rights, that to secure these rights governments are instituted among men deriving their just powers from the consent of the governed."

Our governmental structure was not designed to rule us around the clock from the cradle to the grave. It was not constructed as a source of welfare and cannot function successfully in any such capacity. In the American dispensation the people are responsible for the government but the government was never intended to be responsible for the people. Where the government is made responsible for the people, the people become slaves and the most complete system of human slavery is always to be found where the authority and scope and power of government override the will of the people.

The destructive flames of socialization have been eating into the solid constitutional structure of American liberty for more than a quarter of a century. Meanwhile, the advocates of personal independence and private interprise have been frantically pouring water on those segments of the fire that seem to scorch their own selfish interests. The time has come to recognize that the protective citadel of our freedom cannot be saved by those tactics. Nothing can stop the fire now except a change in the direction of the wind. The currents of American thought must be quickly and fundamentally reversed. We must stop the time honored stampede toward government for the relief of all of the ills which occur in our social and economic system. We must revive the ancient respect for American self-government and self-restraint as prescribed in the Ten Commandments.

Looking at Tomorrow's Prospects

Electric space heating, industrial mechanization, financing, and public relations offer challenges to be met by utility management

Predictions and problems for the future of our industry which I shall discuss do not consider the effects of a total World War III. They assume a continuance of our present mobilized economy.

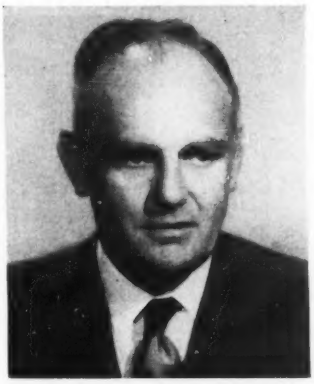
Today we are talking in terms of nearly doubling the 1950 peak load by 1960. By 1965, if our analysis of the future is correct, America's peak power load will be in excess of 165 million kw. Taking into account all factors we are presently able to measure and predict, our industry generally has reached the conclusion that by 1965 we will be producing nearly 750 billion kwhr, selling nearly 650 billion, with a total plant capacity in excess of 195 million kw. If that is our immediate potential, then what are some of the problems with which we should be concerned in achieving and supplying it.

We have felt reasonably certain that electric space heating in the home depends largely on continued development of the heat pump. Wide application of this use brings visions of drastic effects on load factor, on transmission and distribution systems, on the entire concept of residential service.

I do not share these fears. I firmly believe that we will be ingenious enough to supply house heating under conditions that will extract the maximum possible benefit for both the customer and ourselves.

In the field of industrial sales we can make our most significant contribution to ease the current strains on our national economy. Mechanization and increased utilization of electricity in industry is certain to continue. For most companies, under the pressures of high wages, inflated material costs, and high product demand, it is mechanize or die.

The increase in our industrial sales over the coming decade is also based on bright growth prospects for five major power-consuming industries—steel, paper, non-ferrous metals, petroleum and coal products, and chemical. While the growth index for American industry is predicted to reach 230 by 1965, based on the 1935-39 average, the index for these industries is expected to top 320.



J. W. McAFEE
President
Union Electric Co of Missouri

J. W. McAfee, president of Union Electric Co of Missouri and of the newly formed Electric Energy, Inc, studied law at the University of Missouri and entered practice in St. Louis in 1926. He served the city as special tax counsel from 1933 to 1935, when he was elected judge of the circuit court of St. Louis. He reentered private law practice with the firm of Igoe, Carroll, Keefe & McAfee in 1937. Prior to his election as president of Union Electric and its subsidiaries in 1941, he served as the company's counsel.

The management of our industry has achieved progressive flexibility in its thinking and planning, an attitude that expresses itself in ready willingness to change, to expand, to raise its sights rapidly to meet new conditions as they appear.

We can look forward to a continued expansion of our interconnections between systems and to higher transmission voltages. In turn, these new interconnections should have a favorable effect on both load factor and reserve. Our concept of reserve is changing. Some standard will always be necessary for continuity of service but, for that alone, we will require less reserve as time goes on. Our reserves will be needed more for anticipatory growth than for service continuity.

To maintain the growth pace which we have set for ourselves, we are faced with the problem of raising huge sums of money. At the moment, our capital ratios are generally in good shape. Yet, all indications point toward an increased cost for debt financing. As government interest rates inch upwards, ours will be forced ahead also.

The great problem for our industry in the past two decades has been its public relations. There is no indication that the attention to this problem is slackening. I predict that our progress in public relations accomplishments will accelerate. We will begin to experience the growing cumulative effect of information and knowledge which has been disseminated and of the many friends we have made.

While we are on the subject of friendships, we also are gaining them within our own industry. We now have some outstanding examples in our various associations, through ECAP and other media, of excellent cooperative programs.

We cannot escape the conclusion that the world eventually will be powered with energy released by fissionable material. As a power supply, atomic energy must experience two great periods of development. The first is finding the right method to produce power. The second is the gradual supplant of existing sources of power supply. When atomic power supply comes, we will take it in full stride.

What Are the Targets for Tomorrow?

Here are targets in industrial electrification we can shoot for as an industry. We must load the heavy guns, aim high, and aim ahead

In the field of industrial electrification, the electrical industry has demonstrated decisive new qualities of leadership in the postwar years. Even before the present mobilization program put such urgency in the drive to greater productivity, utilities and electrical manufacturers had informally, but none the less decisively, determined to make America more productive. Today, there is no group —in or out of government—which is doing more to force the pace of capital investment and plant modernization.

The electrical industry demonstrated its leadership in this vital field of industrial development in two ways: First, by its own spectacular example; and second, by a series of industrial electrification programs that sprang up after the last war.

Since the war, private utilities have invested more than $8 billion in new plant and equipment and expect to push the total to $15 billion in the next couple of years.

There is one aspect in which the electrical industry has been unique in this postwar period. No other industry has undertaken organized programs aimed at the modernization and expansion of all American industry. It has been going on under many names: load-building, market development, power application, industrial sales. But taken as a whole, these programs are all aimed at communicating electrical ideas to businessmen. They are an attempt to force the pace of electrification by a sort of "information mobilization."

Some of the best of them have been solo operations by local utilities. I hesitate to mention any for fear of overlooking others equally as good. There have been industrial development programs on a regional basis, and the Power and Heating Committee of EEI has been doing much on a national scale.

Another interesting development is the type of cooperative program which is represented by Westinghouse's Productive Power Program and General Electric's More Power to America. These program are without exact precedent in any industry. I think we are dealing here with a significant new step in the development of industrial capitalism. These cooperative programs point the way to new levels of coordination within the framework of a fully competitive economy.

CHESTER H. LANG
Vice President and General Manager Apparatus Sales General Electric Co

A veteran of 32 years with General Electric Co, Chester H. Lang is vice president and manager of marketing for the Apparatus Department. He began as a travelling auditor and also served as assistant manager of the publicity department, comptroller of the budget, and manager of advertising and broadcasting. Well known in the advertising field, he is a former president of the Advertising Federation of America. During World War II Lang headed the War Projects Committee, which coordinated GE's many activities during that time.

There's a lot of history still to be made in this industry. We've only begun this business of industrial electrification. The More Power to American program, for one thing, will be continued without let-up in the years ahead. There will be new development programs, more exhibit materials, more power conferences and a few things we won't reveal just yet.

Regardless of what you call your particular program of industrial development, here are the essential lessons that seem to rise out of the experience during the post-war era with industrial electrification:

1. It requires a continuous, well planned program with long-range objectives.
2. It thrives on cooperation.
3. It responds to bold experimentation in techniques.
4. It must have the wholehearted support of management, in high calibre men who can think big and act decisively.

What are the targets for tomorrow in industrial electrification? Here is what we can shoot for as an industry, in a mutuality of enterprise:

1. Business expenditures of $100 billion for plant and equipment in the next five years! It's never been done. But is that any reason for not trying? As a matter of fact, that conservative sheet, "Electrical World," estimates that the country may put $114 billion into plants and equipment in the next five years.

2. Industrial usage of 10 kwhr per manhour by 1955. This goal exceeds the most hopeful estimates, even based on present accelerated rates of electrification.

3. A 15% increase in productivity by 1955.

4. Annual output in 1970 of 1 trillion kwhr. This is no blue-sky forecast—it's an announcement. I'm as sure of that trillion as I am of my own name.

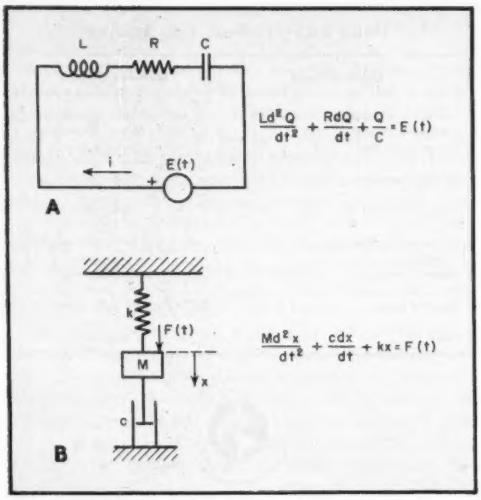


FIG 1—ONE-DEGREE-OF-FREEDOM SYSTEMS can be made from basic electrical and mechanical elements. The LCR electrical system (A) finds its equivalent in the mechanical vibrating spring system (B) representing a damped conductor

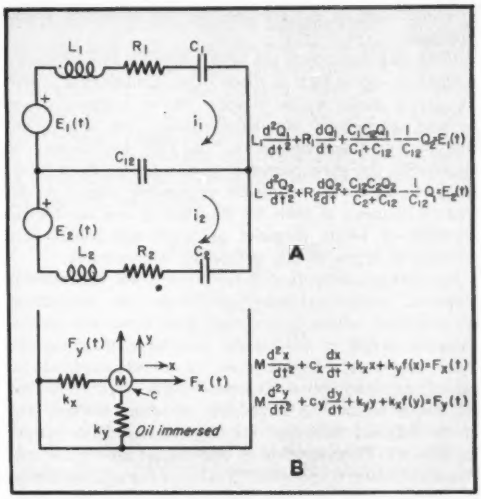


FIG 2—TWO-DEGREES-OF-FREEDOM SYSTEMS can be constructed from electrical elements (A) or from equivalent mechanical elements (B). Note that each degree of freedom mechanically is analogous to a mesh (circuit loop) electrically

Recommendations for Reducing Vibration Of Conductors Based on Field Data

Conductor vibration can be reduced by applying dampers and armor rods as mechanical impedance matching devices. Lower stress limits on conductors and overhead shield wires result in less conductor breakage

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Considerable attention has been given to conductor vibration of suspended transmission lines during the past 25 years. Even so, power company engineers believe they have only started to get a solution to this problem. To better understand the use of various types of dampers and armor rods in combatting conductor vibration, some thought has been given as to the exact function of these damping devices. Heretofore most analysts have considered them as being energy absorbers or dissipators. But by introducing the electrical analog it may be shown that these devices function as mechanical impedance matching devices, both tuned and untuned. Considered in this light, proper design and installation of damping devices can make them more effective in reducing vibration.

As a further aid to understanding the problem, a review of vibration data and experience recently reported by nine power companies and cable manufacturers is presented here. A study of the data indicates certain limitations which form the basis for recommendations helpful in vibration reduction.

Basic Definitions . . . Two categories of vibration which have caused breakage of lines near suspension supports are aeolian vibration and galloping or dancing conductors. Aeolian vibrations are those of the natural frequencies of the suspended span, which are stimulated by very steady winds of 1 to 30 mph. Frequencies range from 1 to possibly 100 cps and the amplitudes normally range from a fraction of an inch to several inches. However, amplitudes of 5 ft and more have been observed. Frequency and amplitude of aeolian vibrations are functions of wind velocity, span length, distance between nodes, conductor tension and diameter, and conductor weight per unit length. On short spans vibration is of extremely small

amplitude and is evident only by the humming sound produced.

Galloping conductors are large-amplitude low-frequency vibrations—up to 10 ft at about 1 cps. Galloping is caused by strong gusty winds blowing across irregularly ice-covered conductors. No definite means has been found for damping these vibrations. The only known way of eliminating the phenomenon is to prevent ice from forming or to melt it off as quickly as possible after it forms. Critical diameter of cable for ice forming is about 1.4 in., ie, cable of 1.4-in. diameter or larger will collect very little ice in heavy storms at freezing temperatures.

Stockbridge dampers and armor rods are two popular means of combating aeolian vibrations. By introducing the electrical analog it is shown that these and similar dampers, acting as mechanical impedance matching devices, introduce reflected waves of proper amplitude to cancel unwanted waves. Dampers of the Stockbridge type are tuned mechanical impedance matching devices, and armor rods and "festoons" are untuned impedance matching devices. Consideration of the electric analog for mechanical systems is important because of the relative ease in setting-up an equivalent electrical system. Two basic vibrating systems, of one degree of freedom, are illustrated in Fig 1. An examination of the behavior of the mechanical spring system reveals that the same differential equation governs its behavior as does that for the LRC electrical system. The analogs are shown symbolically in the accompanying table.

Equivalent two-degrees-of-freedom systems are illustrated in Fig 2. There the mutual coupling is elastance (capacitive). It is possible to have either capacitive, inductive, or resistive coupling or any combination thereof. The significant point to note is that each degree of freedom of the mechanical system is analogous to a mesh of the electrical circuit, where a mesh is a circuit loop. Consideration of basic definitions and vibrating systems as reviewed in this section lend to an understanding of these nine reports.

Units and Symbols for Analogs

Electrical Term		Mechanical Term	
Voltage or emf (volts)	E(t)	F(t)	Force (pounds)
Inductance (henrys)	L	M	Mass ([lb-sec]²/in.)
Charge (coulombs)	Q	X	Distance (inches)
Current (amperes)	$i = \frac{dQ}{dt}$	$v = \frac{dX}{dt}$	Velocity (in./sec)
Resistance (ohms)	R	c	Damping (lb-sec/in.)
Reciprocal of capacitance (farads)	$\frac{1}{C}$	k	Spring constant (lb/in.) (elastance)
Magnetic energy	M.E. = ½ Li²	K.E. = ½ Mv²	Kinetic energy
Potential energy	P.E. = ½ $\frac{Q^2}{C}$	P.E. = ½kX²	Potential energy
Power loss	i² R	c v²	Power loss

Texas Power & Light . . . Experience with several lines of Texas Power & Light Co has shown that rigid suspension clamps and high tensions facilitate fatigue failure in less than one year. Tensions of 25 to 35% of ultimate strength at 60 F are considered high. One overhead extra high strength shield line supported by semi-flexible clamps, at 18% of ultimate strength and 60 F, developed breaks in less than four years as a result of aeolian vibration. After tension was reduced to 14.5%, there was no evidence of further trouble for seven years.

Several overhead ground-wire lines having rigid supports and carrying tensions of 10% have evidenced no vibration difficulties in over 30 yr of service. In 1947 a line was built with shield wire equipped with preformed armor rod and flexible supports, and installed with a tension of 20% of ultimate at 60 F. There have been no vibration difficulties.

Colorado Public Service . . . A brief review of the field experience of Public Service Co of Colorado during the last 41 years indicates that armor rods should be used at all supports for main conductors of ACSR transmission lines. Still more desirable vibration characteristics have been exhibited on these lines when the line tension is limited to 20% of ultimate at 60 F and dampers are used at all dead ends. Dampers are also used on all spans over 1,000 ft.

Los Angeles . . . The Department of Water and Power, City of Los Angeles, has operated the 287.5-kv Boulder transmission lines for 15 yr. Initially, dampers of torsional design were applied in locations which were regarded as particularly bad from a vibration standpoint. Not until late 1949 was any trouble experienced due to vibration. A complete line inspection disclosed nine segment cracks (See EW, Apr. 17, 1950). Laboratory measurements showed that much less energy was required to vibrate the cable after 15 yr in service than when it was new. Also, it was shown that the torsional dampers were far less effective than when the cable was new.

When the cable was oiled so that oil lubricated the dovetail joints of the Type HH conductor, the required energy to produce vibrations was greater than that required when new, and torsional dampers became as effective with the oiled conductor as with the new. It was deduced that increased friction between conductor sections became so large after 15-yr service that sliding was no longer present. Thus, absorption of energy which produces vibration was reduced sufficiently so that severe vibrations developed.

It has been found that either Stockbridge or Swedish dampers are highly effective in reducing vibrations in the 287.5-kv line to a safe level. It is anticipated that total

application of dampers of one of these types will be necessary to insure the desired 50-yr life with a margin of safety.

Ground wires of the Boulder transmission lines are of ½-in. extra high strength galvanized strand having a breaking strength of 18,000 lb. A normal tension of 1,800 lb at 60 F is used—10% of ultimate. Although special suspension clamps of the trunnion type are used, no vibration dampers have ever been used on the overhead ground wires. The Department has also designed a 258-mile, 230-kv, single-circuit steel-tower line which is now under construction. It is being shielded with the same ½-in. extra high strength wire. A normal tension of 2,100 lb at 60 F is being used—12% of ultimate. No dampers are considered for the shield wire.

The new line is being constructed with 954,000-cir mils ACSR conductors in 1,100-ft spans at a normal tension of 4,600 lb at 60 F and a maximum tension of 10,000 lb with ice and wind loading. Rated strength of the conductor is 34,200 lb which gives a tension of only 13.5% of ultimate at 60 F. Control of possible aeolian vibrations is considered of sufficient importance that armor rods and Stockbridge dampers are being installed at all supports on the new 230-kv line.

Oklahoma Gas and Electric . . . Four relatively new transmission lines developed severe aeolian vibrations on the overhead shield wires of extra high strength cable. The oldest, built with a tension of 25% of ultimate strength at 60 F, experienced extreme vibration fatigue in less than 20 months. At one end of the line, it was found that one or more strands were broken at 100 of 122 suspension clamps. The line was resagged for 15% tension, and armor rods were installed at each support.

The three other lines had tensions of 25%, 25%, and 21.5%, respectively. Severe vibrations were observed and a number of broken strands were found in the shield wires after only five months of service. Each has been resagged for a tension 15% and armor rods have been installed at each support. Two other lines, originally sagged for 15%, have been operating in this area for 20 years. No shield wire difficulties have been found with them.

Southern California Edison . . . By using the electrical analog Southern California Edison Co verified that the Stockbridge damper and armor rods are not true dampers. There is very little energy dissipated in these devices. The Stockbridge damper introduces a reflected wave into the system at a point one-quarter wave length from troublesome reflection points so that the introduced wave is 180 deg out of phase with the unwanted reflections. It has the proper amplitude to exactly cancel the unwanted wave. For most effectiveness multiple dampers (2, 4, 6, or 8) are mounted near each suspension support to cancel the first harmonic and several higher harmonics of vibration.

Armor rods are like untuned matching devices as tapered horns of a microwave guide. They introduce reflections all along the length of the taper. Armor rod is found to be much more effective when it, too, is tapered. A somewhat similar effect is obtained by using very long tapered support clamps.

Ontario Hydro-Electric . . . This information was obtained from tests and field experiences of the Hydro-Electric Power Commission of Ontario. Tests made on ACSR conductors of sizes 3/0 to 605,000 cir mils on spans of 650 to 1,400 ft demonstrated that there is little tendency to vibrate below a tension of about 8% of the ultimate strength. As the tension is increased above 8%, maximum deflection increases rapidly up to 15% tension, after which maximum deflection remains constant for further increase of tension. The number of cycles of vibration per day above any given deflection increases almost linearly with tension, ie, frequency is proportional to tension. Further, the span length does not seem to be a major factor in vibration.

Since 1940 the Commission has adopted the practice of omitting armor rods completely and using dampers exclusively to prevent damage by aeolian vibration on all high voltage circuits. One damper is installed on each side of each suspension support. The mounting distance is 6 ft from the support for 795,000-cir mils ACSR conductor and is less for smaller conductors. More than two dampers are arbitrarily used at each support for spans over 1,200 ft. Line tensions of 15 to 19% at 60 F are used.

A trial attempt was made to control galloping conductors in a high voltage 2,200-ft river span, which had given trouble on three occasions. Torsional dampers were installed, eight per span per conductor. No claims were made for this as a cure for galloping. However, it is noteworthy that the span has been free of galloping for approximately four years.

Aluminum strands of ACSR conductors may be broken by flexure fatigue introduced by either galloping or aeolian vibration. Breaks in aluminum and other wires which are caused by galloping have a course fracture such as is obtained when small soft wires are broken in reverse bending by hand. Failures due to aeolian vibration are characterized by a glassy fracture which is generally accompanied by a peculiar S-curve across the diameter of the wire.

Breaks which have been discovered on the Commission's lines have generally been at dead-end clamps of an old design on ACSR conductor lines which have tensions greater than 10% of ultimate at 60 F. In each case structural patterns on severed aluminum strands indicated both galloping and aeolian vibration fatigue. Steel

cores broke within the cable at a distance of 3 to 4 ft from the ends of the broken aluminum strands. At this point, heat of current flow in the steel core could not be carried away fast enough; the metal became hot enough to flow and was pulled to its ultimate strength.

Bonneville Power . . . During the last nine years Bonneville Power Administration has accumulated valuable field experience and has made many conductor vibration studies on their 33 transmission lines. Most of these lines are of 230-kv steel-tower design.

All vibration studies and tests were made on energized lines. Data show that two or three Stockbridge dampers on each side of the support clamp are most desirable to eliminate harmful vibrations. The number of dampers depends upon the span length, however. For example, one damper is used on each end of spans up to 1,200 ft; two dampers on each end of spans of from 1,200 ft to 2,200 ft; three dampers on each end of spans of from 2,200 ft to 3,200 ft. This practice is followed on 500 Mcm expanded copper conductor as well as on 795 Mcm ACSR conductor.

To be most effective over a wide band of frequencies, spacing of the dampers at one end of the span is "staggered" with respect to those at the other end by using 3½-ft spacing at one end and 4-ft spacing at the other. On 500-Mcm conductor, fundamental frequency, in cycles per second, is three times wind velocity expressed in miles per hour.

All ACSR conductors were originally installed with tapered armor rods. No signs of fatigue failures have been found on the ten-year-old line. However, numerous breakages of one to eight of the outer copper strands have been discovered on a 500-Mcm expanded high-strength copper conductor at 23½% of the towers in a 100-mile section of a 230-kv line which did not have armor rod or dampers. Special low-magnetic preformed armor rods are now being applied to repair the cable to its original strength and also to combat further aeolian conductor vibration.

Tests By Manufacturers . . . The recent increase of failures produced by aeolian vibration of higher-strength-type of strands of overhead shield wires indicated that materials were being worked beyond their endurance limits. American Steel and Wire Co evaluated mechanical properties, construction practices, and other factors which might now be affecting performance. Reversed bending tests of center wires of different seven-wire strands were made to obtain the endurance limits. These tests were followed by vibration fatigue tests on complete strands held under tension in conventional line hardware. Plots of test data indicate that the usual tension of 25% of ultimate at 60 F, as specified by the current National Electrical Safety Code, is excessive for the materials now used. Data indicate that the use of 20% of ultimate at 60 F would be a more appropriate limitation for the extra high strength materials used. Furthermore, data show that an increase of sag up to 50% is obtained when limitations are reduced to the more appropriate level.

Extensive tests were also made on stranded cable equipped with preformed armor rods and held under tension in conventional line hardware. For a given amplitude level, armored strand had a life more than ten times that of the unarmored strand. It is recommended that armor be used at all points of support in locations where vibration is liable to be a hazard.

The Aluminum Company of America has made quantitative tests which show that Alcoa armor rods contribute considerably more damping than has been formerly recognized. Further, damping ability increases with higher effective wind velocities. Tests also show that auxiliary cables of steel-wire rope or multiple-strand, fully-annealed aluminum cable used as "festoons" at supports are very effective as dampers on 1,000-ft spans of 397,500-cir mils 30/7 ACSR.

Application of a single Stockbridge damper at one end of a 1,000-ft test span of a large ACSR conductor, which was vibrating vigorously in the wind, quickly and completely damped the vibration. The test was repeated many times to insure the results.

Recommendations . . . There is need for continued research and study of means available for matching mechanical impedance of a conductor span at its supports. Use of the electrical analog has proven to be quite helpful in the study and indications are that it will continue to contribute valuable information.

The Stockbridge damper, armor rods and several other dampers are means of mechanical impedance matching. By proper design and installation, these dampers (impedance matching devices) can be made much more effective in reducing conductor vibration.

Limitations for stressing overhead high-strength shield or grounding cable should be lowered to 15% of ultimate at 60 F as compared with the present code of 25% at 60 F. More thought should be given to use of flexible suspension clamps.

Conductors of high voltage transmission lines should be sagged to carry a tension not to exceed 20% of ultimate strength at 60 F. Stockbridge or similar dampers should best be installed at all supports.

It has been found desirable in many cases also to install armor rods at each flexible suspension support and dead end. It is known that armor rods effectively suppress vibration and give added protection. However, collected data indicate that properly installed dampers of the Stockbridge type, and others, should sufficiently reduce aeolian vibrations.

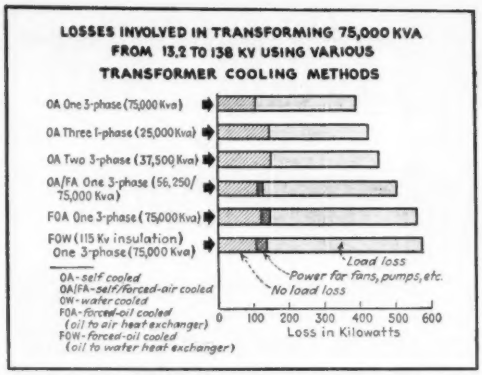

LOSSES INVOLVED IN TRANSFORMING 75,000 KVA FROM 13.2 TO 138 KV USING VARIOUS TRANSFORMER COOLING METHODS
OA One 3-phase (75,000 Kva)
OA Three 1-phase (25,000 Kva)
OA Two 3-phase (37,500 Kva)
OA/FA One 3-phase (56,250/75,000 Kva)
FOA One 3-phase (75,000 Kva)
FOW (115 Kv insulation) One 3-phase (75,000 Kva)
Load loss
Power for fans, pumps, etc.
No load loss
OA-self cooled
OA/FA-self/forced-air cooled
OW-water cooled
FOA-forced-oil cooled (oil to air heat exchanger)
FOW-forced-oil cooled (oil to water heat exchanger)
0 100 200 300 400 500 600
Loss in Kilowatts

FIG 1—TRANSFORMER LOSSES vary with type of equipment; single or three-phase, self cooled, forced-air cooled, forced-oil cooled, as well as the type of insulation

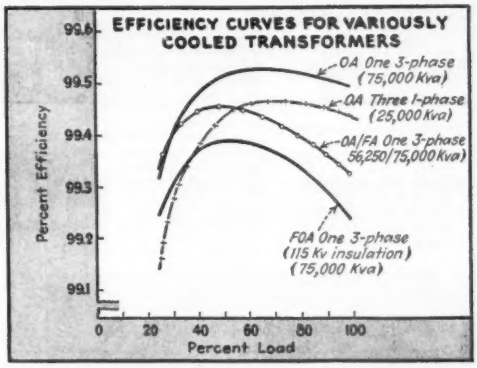


FIG 2—TRANSFORMER EFFICIENCIES vary with loading and basic design. Curves are based on a hypothetical 75,000-kva, 138-kv load with transformer losses as shown in Fig 1

Evaluate The Losses First— Then Select The Transformer

Author shows that while forced-air, forced-oil, and water-cooled transformers cost more, the added investment can be written off over a period of years through reduced losses

L. W. SCHOENIG, Engineer, Transformer Section
Allis Chalmers Mfg Co., Milwaukee, Wis.

Transformer losses are more and more becoming a contributing factor in the selection of transformers. To understand and appreciate their effect, let us compare the losses incurred by the various methods of handling a given load. These losses will vary considerably.

Combined copper losses of three single-phase transformers will be the same as that of the three-phase transformer. The core loss, however, will be about 20% higher for the single-phase units because, at the same flux density, about 20% more core iron is used in three single-phase transformers than in one three-phase unit.

The three-phase self-cooled transformer has the lowest total loss and highest core loss of any cooling method. On the other hand, a similar unit with forced-oil cooling has the highest total loss, but the lowest core loss. The three-phase self-cooled transformer uses most core iron in its construction and therefore it has the highest core loss. It also uses the most copper and therefore the copper loss is lower.

High total loss and low core loss of forced-cooled transformers result from the increase in capacity provided by the auxiliary cooling equipment. Core and coils are actually operating at about 60% of rated load. Copper loss at rated load, is therefore, $(1.67)^2$ times that at the 60% rating. Core loss is low as a result of the small core and coils. The forced-oil transformer uses the least amount of core iron and the least amount of copper. The smallest amount of core iron results in lowest core loss. The smallest amount of copper results in highest copper loss.

Rated load is the 55 C rating of a transformer with cooling equipment, if any, in operation. For example, the core and coils of a 75,000-kva forced-cooled transformer are equivalent to a 45,000-kva self-cooled unit. The increase in capacity to 75,000 kva is obtained by dissipating the additional losses with oil to air or oil to water heat exchangers.

Fig 1 compares the no-load and total losses of the various methods of transforming a 75,000 kva load from 13.2 to 138 kv. Power requirements for fans and pumps have been included. Efficiency curves in Fig 2 were calculated from the losses in Fig 1.

First Cost . . . As an example of how various types of cooling affect transformer initial cost, let us examine the first cost of the different methods by which the 75,000-kva load mentioned above can be handled. The low voltage will be delta-connected and the high-voltage, wye-connected, arranged for solidly grounded operation. Fig 3 compares the first cost of the usual methods of transforming 75,000 kva. It can be seen that the initial cost of a transformer bank can be materially reduced by utilizing three-phase in lieu of single-phase transformer con-

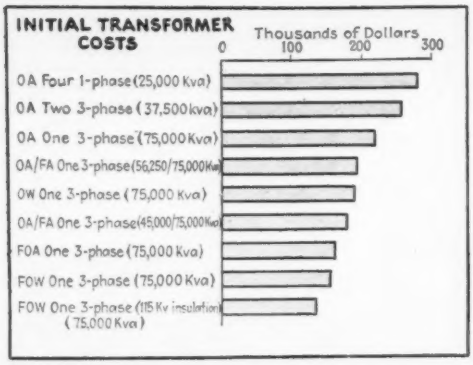


FIG 3—INITIAL TRANSFORMER COSTS vary with installation as shown by estimates for 75,000-kva, 138-kv load. Initial cost can be reduced by using three-phase transformers

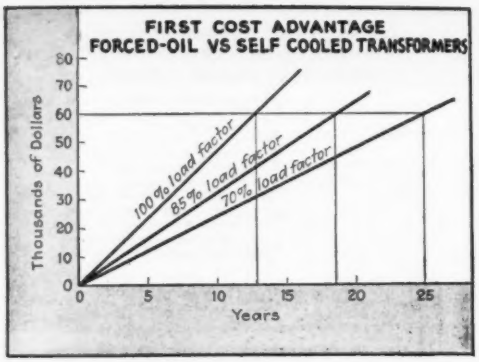


FIG 4—REDUCED LOSSES compensate for higher initial cost of self cooled transformers. Time required for reduced losses to compensate for higher initial cost varies with load factor

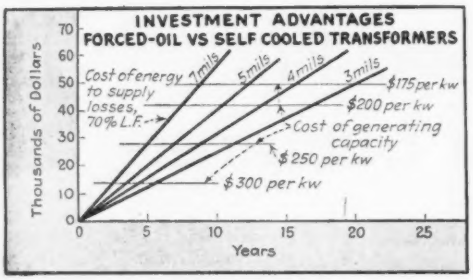


FIG 5—WRITE OFF PERIOD for greater operating cost of forced-oil compared with self cooled transformer varies with the estimated value of energy required to supply losses

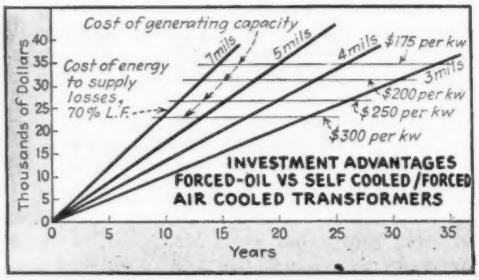


FIG 6—WRITE OFF of additional costs of forced-oil cooled compared with self cooled/forced-air cooled transformer varies with estimated value of energy required for losses

struction. The initial cost can be further reduced by using forced-cooling and by reducing the insulation level of the high voltage winding.

Evaluating losses . . . If losses are to be considered, the simplest method of determining overall cost of a transformer installation is to capitalize the losses, consider the initial cost, and neglect all other factors. This method is based on the premise that it is unnecessary to increase generating capacity to supply transformer losses, and neglects completely the cost of financing the transformer investment. However, load factor has a definite bearing on the total transformer losses and since this affects the capitalization, it should be considered.

Initial costs from Fig 3 and losses from Fig 1 provide the interesting comparison shown in Fig 4. The difference in first cost between the self-cooled and forced-oil cooled 75,000 kva, three-phase transformers is plotted against the time required for the evaluation of the greater losses of the forced-cooled unit to offset its initial cost advantage. The difference in losses of the two transformers is evaluated for various load factors at 3 mills per kwhr generating costs.

Total costs of the two transformers are equal at 13, 18, and 25 years for 100%, 85%, and 70% load factors respectively. Up to these times, the initial cost of the forced oil-cooled transformers plus the cost of the losses is less expensive; beyond however, the self cooled unit becomes less expensive.

When excess generating capacity is not available to supply losses, or when a more thorough comparative analysis of the cost of transformer installations is needed, these items must be taken into consideration:

1. Cost of installing additional generating equipment.

2. Interest on money required to finance initial transformer cost.

3. Interest on money required to finance cost of additional generating equipment.

Fig 5 considers these factors for the same transformer comparison as was made in Fig 4. It is assumed that the initial transformer cost and the cost of additional generating capacity is financed on a 20-year basis at a yearly interest rate of three percent.

A comparison, similar to that in Fig 5 is shown in Fig 6 for self-cooled, forced air-cooled, and forced oil-cooled transformers.

Write off of additional costs of forced-oil cooled compared with self cooled forced-air cooled transformer varies with the estimated value of energy required to supply losses.

In the case of hydro systems, where the generating cost of transformer losses is frequently neglected, transformer comparisons can be made on the basis of initial cost, cost of installing generating capacity, and interest cost on the total investment.

New "MIDGET SUBSTATION" makes lamps burn brighter, last longer

G-E INDUCTROL POWER PACK

combines breaker, transformer, regulator in one convenient package

If your plant has combined light and power circuits, you may have noticed how illumination can fall off during plant load peaks. You may also have had trouble with shortened lamp life due to overvoltage.

In either case, here's a brand new "packaged" answer to better voltage regulation—the G-E Inductrol Power Pack.

The new Inductrol unit is, in effect, a midget load-center substation, combining circuit breaker, transformer, and induction voltage regulator in one convenient, space-saving package. It takes the 480 or 600 volts from your power line and converts it to the uniform 120 volts required for maximum lamp output and life. For greater production, more accurate testing, and better performance of electronic equipment, investigate the new G-E Inductrol Power Pack. Contact your G-E sales representative, or authorized G-E agent—or mail your coupon today. *Apparatus Dept., General Electric Co., Schenectady 5, N. Y.*

G-E Inductrol Power Packs on factory's roof stanchions are housed in attractive, completely metal-enclosed, easily installed cabinets.

INDUCTROL POWER PACK

General Electric Co., Section H321-73
Apparatus Department
Schenectady 5, N. Y.

Please send me Bulletin GEA-5571 on the new G-E Inductrol Power Pack.

Bulletin needed for:

.....Reference purposes

.....Planning an immediate project

NAME.....

POSITION.....

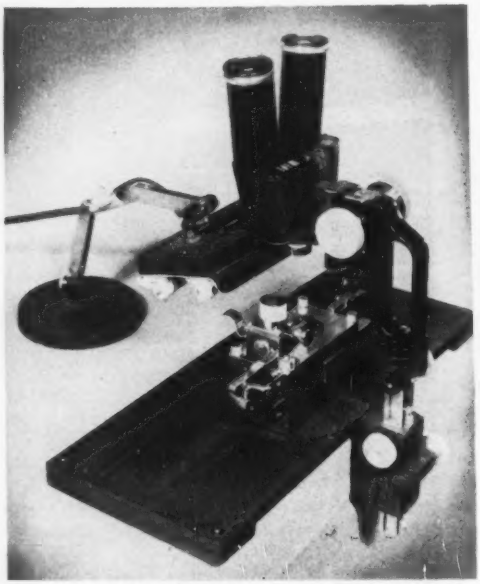
ADDRESS.....

CITY.....ZONE.....STATE.....

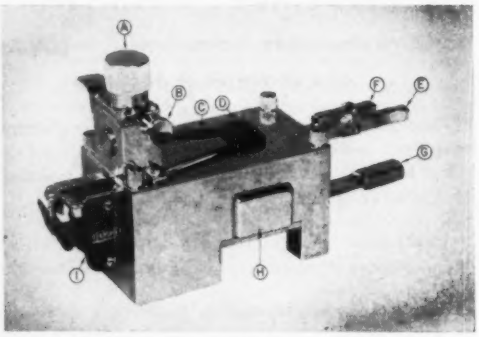
GENERAL ELECTRIC

HOW TO DESIGN • CONSTRUCT OPERATE • MAINTAIN

Inspection Device for Watthour Meter Ball Bearings



IN OPERATING POSITION under the microscope, the device adroitly handles small ball bearings as described below



INSPECTION DEVICE permits operator to examine several hundred ball bearings without removing her hands from the controls or her eyes from the microscope. Reference letters are keyed to information given in box at lower left of page

E. H. TYSON
Superintendent of Meters
Pennsylvania Power & Light Co
Hazleton, Pa.

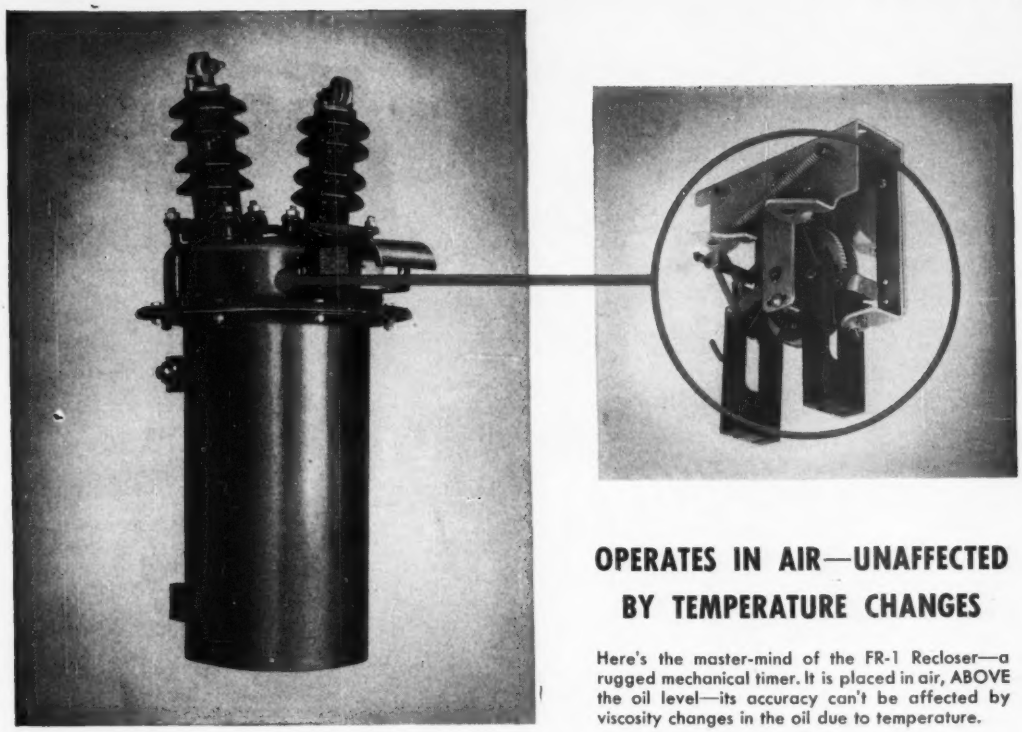
It is desirable to carefully examine both new and used ball bearings for watthour meters to prevent dirty or defective bearings being placed in service. Suitable microscopes and light sources have been available for some time but the handling of the bearings has been difficult and slow, chiefly because of their small size. Also, the use of tweezers has left much to be desired.

A device for easily and quickly inspecting bearings has been developed and built by Foster L. Carter, of the General Meter Dept, Pennsylvania Power and Light Co. This device releases the bearings from a hopper one at a time, rolls them for examination under the microscope, and then separates them after examination into one of three hoppers. All operations are performed without the use of tweezers. This device increases considerably the rate of examination and the reliability of classifying according to condition.

Made of chrome-plated steel and brass, it measures 3 x 4 x 8 in. It is very sturdy and compact, can easily be disassembled for cleaning. A single filling of the hopper permits inspection of several hundred bearings without the operator removing her hands from the device or her eyes from the microscope. A Veeder counter tallies the number of bearings inspected.

THESE ARE STEPS FOR INSPECTING BEARING

After the balls are run through a cleaning process they are placed in hopper (A). Depressing plunger (B) releases one ball at a time. Ball rolls down tube (C) into cup (D) and rests on arm (E). Moving arm (E) in and out of its channel rotates the ball so its entire surface can be inspected. On the top of arm (E) is a lever (F) which controls stroke of (E). After slowly moving (E) back and forth, the inspector determines if ball is "Good," "Dirty," or "Defective." By moving lever (G) to one of three positions, according to condition of ball, a compartment (H) having three small brass boxes is shifted so that proper box for the condition of the ball is placed under a release hole in arm (E). Depressing lever (F), operator can move (E) inwardly, releasing ball into proper box; at the same time "one" is added on counter (I). Arm (E) is then returned to its normal position and the inspection cycle is repeated.



OPERATES IN AIR—UNAFFECTED BY TEMPERATURE CHANGES

Here's the master-mind of the FR-1 Recloser—a rugged mechanical timer. It is placed in air, ABOVE the oil level—its accuracy can't be affected by viscosity changes in the oil due to temperature.

Precise Timer on G-E RECLOSER

means fewer outages, reduced service trips

Regardless of extreme temperature conditions, the precise mechanical timer of the General Electric FR-1 Automatic Recloser operates with clock-like accuracy. Its time-current characteristics remain exactly as published.

As a result, you are assured of positive co-ordination—with breakers, with reclosers in series and with fuses.

The FR-1 resets in a matter of seconds. You avoid unnecessary fuse-blowing and recloser lock-outs from rapidly recurring faults. There are fewer outages and service trips are reduced to a minimum.

Inrush current can't lock out the General Electric FR-1 recloser. It has an exclusive "time-delay" function—holds closed until inrush currents have subsided, then automatically resets for normal operation. Many users find that this feature permits fewer sectionalizing points—makes possible a saving in system investment.

For a more complete story of the FR-1 recloser write for GEA-4934. Address your nearest G-E Apparatus Sales Office or *General Electric Company, Schenectady 5, N. Y.*

853-52

GENERAL ELECTRIC

A NEW 500-KVA General Electric network transformer is lowered into its vault in St. Louis. The throat-mounted G-E network protector is shown on the right; the high-voltage switch is on the opposite end of the transformer.

More Capacity for St. Louis' Network System

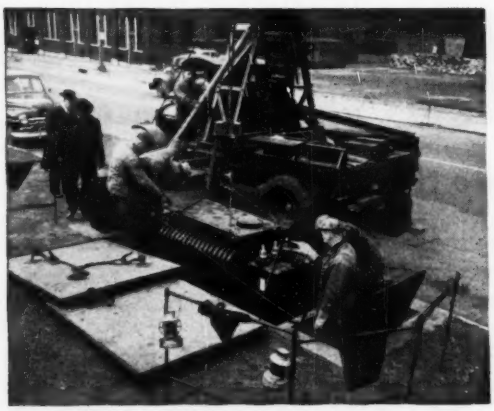
Installation of this G-E Network Unit demonstrates once more how a network eliminates headaches connected with load growth

It's an old story to users of networks, but still mighty impressive—the ease with which you can meet increased loads, once you have gone to a network system.

The place is St. Louis. The utility, the Union Electric Company. Load in the area around Clark Avenue and 15th Street had grown to the point where an additional transformer was needed.

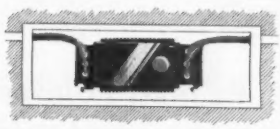
With a network, this addition was easy! A vault was constructed. A high-voltage feeder extended two blocks, from Market and 14th. The secondary cable brought into the vault. Then, with everything ready, and at the convenience of the construction crew, a new 500-kva transformer was installed—and connected during the daytime, with no interruption of service. With a total of three different high-voltage feeders serving the area, the one involved in this installation was killed while the new network unit was being connected. When all was set, the feeder was re-energized and the new transformer picked up its share of the network load.

With a network, service connections as well as low voltage grid connections are provided initially thus eliminating any need for rearrangement or reinforcement when a new transformer is added. In every respect, each added transformer represents an orderly step in system growth that was all automatically provided for when the network was first installed. *General Electric Company, Schenectady 5, New York*

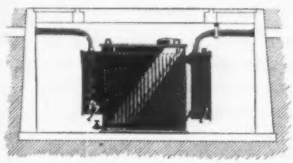


ALMOST IN PLACE! By using standard G-E network units, Union Electric Co. has kept vault construction costs to a minimum. Complete servicing of the transformer, switch, and protector can be done from the two ends—so that the vault can be made narrow enough to fit between sidewalk and curb.

Narrow, shallow vaults when you use G-E Standardized Network Equipment



With manhole openings at both ends, vault need be only 14' long, 4½' wide for a 500-kva transformer.

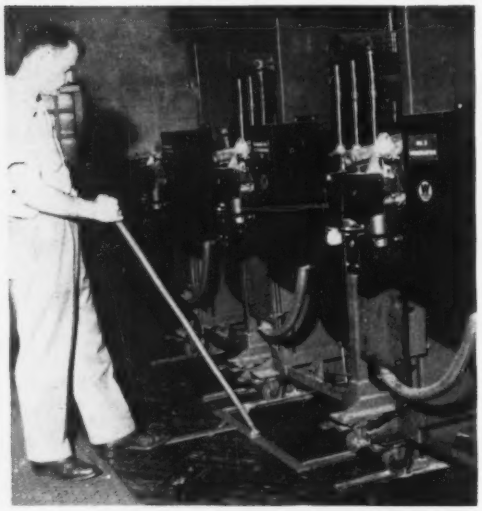


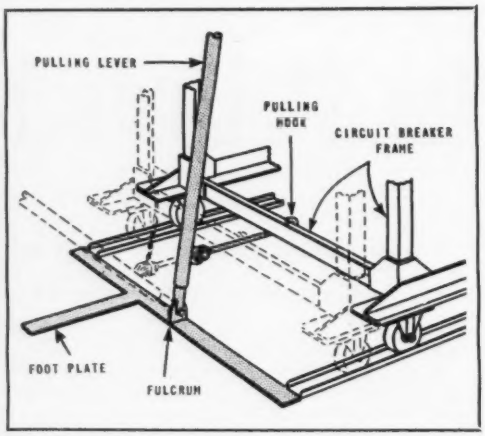
A vault depth of 7' below roof slab will provide sufficient room for maintenance and inspection.

GENERAL ELECTRIC

402-109

Puller Removes OCB's Without Personal Hazard





CIRCUIT BREAKER PULLER is designed to remove quickly and safely units which have no provision for un-racking. With this device one man can un-rack breakers with no danger of injuring himself. Puller was built from salvaged parts

R. W. SPEAS
Superintendent
Kanawha Valley Power Co
Marmet, West Virginia

Oil circuit breakers which have no provision for un-racking can be quickly and safely removed with a special puller. Using this accessory, one man easily un-racks breakers at the London, Marmet, and Winfield hydroelectric plants with no danger of injuring himself.

Design of the breakers at these plants is such that spring tension on the contacts creates a great amount of friction when an attempt is made to unrack them. Heretofore, it frequently has been necessary to have two men pull a breaker.

Materials for the puller were largely salvaged from odd sizes stored in bins. With fulcrum floor plate braced against breaker rails and held in position by left foot, an 11:1 leverage is obtained for pulling breaker out of compartment. Bolts serving as hinge pins should be welded to their nuts to keep them from working loose during operation.

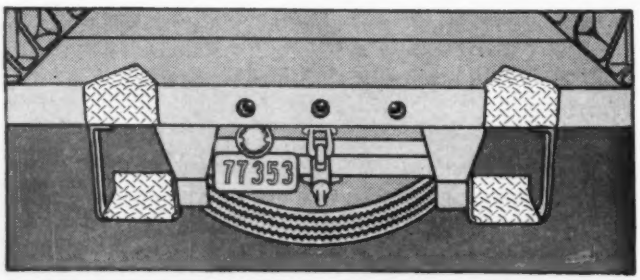
Painted Pointers Eliminate Hazard on Line Truck

HARRY B. FULLER
Indiana & Michigan Electric Co
Elkhart, Indiana

A small amount of paint was all that was needed in effecting an improvement to prevent injuries to linemen dismounting from the deck of line trucks.

Obscure steps at the rear of a line truck were painted a bright aluminum so that they would contrast sharply with the drab deck of the truck platform. This was done at the suggestion of a garage mechanic. He observed an employee who missed the recessed step when dismounting from the rear of the truck and had a near lost-time accident.

The hazard was eliminated on two line trucks at a negligible cost—one half hour of labor and a few cents worth of paint. The bright pointers on the deck of the truck now indicate the exact locations of the steps below.



BRIGHT POINTERS, coated with aluminum paint, indicate on deck of truck location of recessed steps below. Painted pointers aid linemen in dismounting safely. Mechanic suggested this safety scheme after witnessing a near lost-time accident

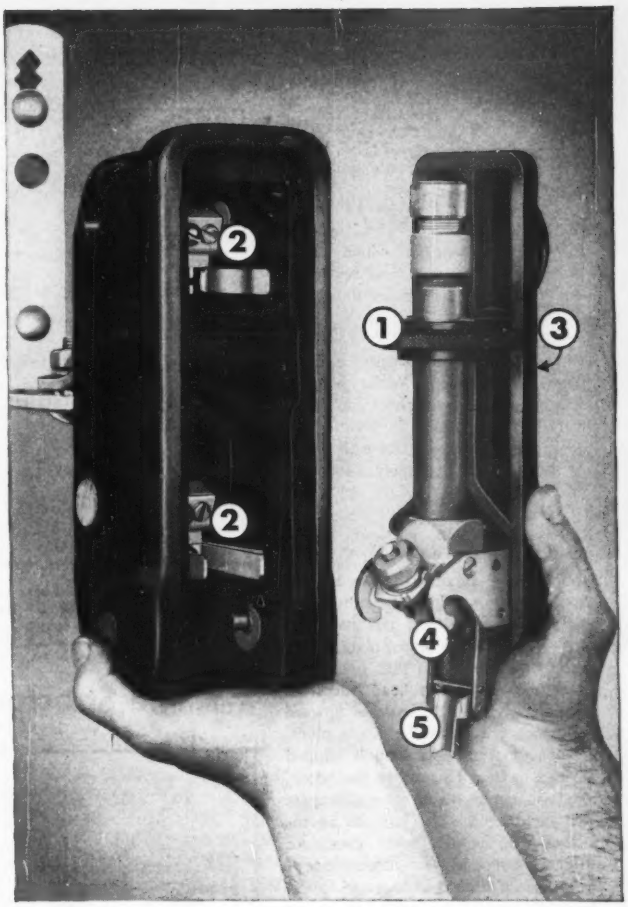
1. **FLASHOVER PREVENTED** by a neoprene-sealed barrier between top and bottom contacts.

2. **REINFORCED CONTACTS** and double-clamp terminals for 2/0 conductor are silver plated.

3. **CLEAR IDENTIFICATION** is assured by white disk monogram on front of door which assists in zoning applications.

4. **RECOIL CUSHIONING** is achieved by springs located between the door and hinge assembly.

5. **POSITIVE INDICATION** of blown fuse is given by a double spring-operated indicator arm.



Lowest-priced 100-ampere fuse cutout for high-capacity feeders

This General Electric 100-ampere heavy-duty fuse cutout gives you:

- One cutout for either 50-ampere or 100-ampere requirements
- Positive full-range operation with any fuse link up to and including its 100-ampere rating
- Reliable interruption up to 8000 amperes at 2.5 kv, 5000 amperes at 5.2 kv

Yet its price is no more than that of its *50-ampere* predecessor.

You'll like the economy and reliability of this G-E cutout for your high-capacity feeders. See your local G-E representative for complete information—or write for Bulletin GEC-704, addressing *General Electric Company, Schenectady 5, New York.*

GENERAL ELECTRIC

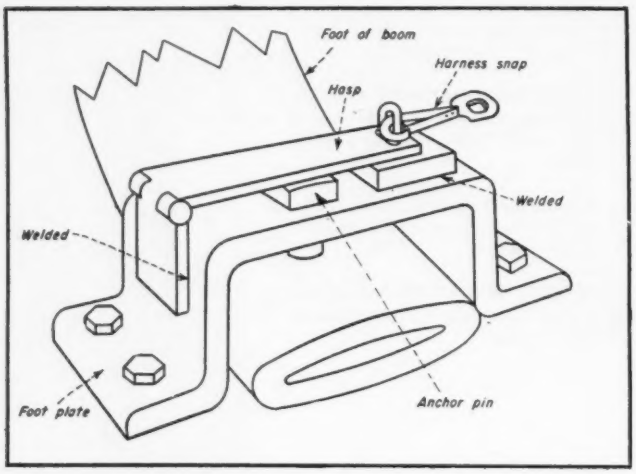
406-41

Hasp and Staple Secure Boom Anchor-Pin

E. R. RUDASIL
First Class Lineman
The Ohio Power Co
Hicksville, Ohio

On line-construction trucks the foot of the derrick boom is held by a removable anchor pin which passes through the foot-plate and reinforced steel-plate truck floor as illustrated. Unless this pin is held so it cannot work upward and out of the foot-plate and boom, serious accidents can occur from falling booms. While this division has never had a boom anchor-pin work out completely, the sight of this pin gradually coming out with a load on the boom is extremely disconcerting.

A relatively simple and inexpensive safety device developed by the author is used in this division and has been found very effective to secure the boom anchor pin. A substantial, hinged hardware hasp and its staple are welded to the upper plate of the boom foot-plate, just high enough to clear the anchor-pin head but close enough to prevent excessive upward movement. To lock the pin in place, a substantial harness snap is clipped on the staple. To remove the boom, the hasp can be swung open to remove the anchor pin. The pin can be replaced and locked in the foot-plate after the boom has been stored to prevent loss of the pin or damage to the hasp while moving material in or out of the truck. Including welding, the whole job should not cost more than two dollars.



SAFETY HOLDER secures boom anchor-pin when substantial harness snap is clipped on staple. Pin is locked in place to prevent its loss after boom is removed

Power and Carbon Costs Per Pound of Aluminum—1949

	(1)	(2)	(3)	(4)
Costs in cents per pound*				
Power**	0.598	1.78	1.81	2.38
Carbon electrodes	1.429	1.31	n.a.	1.62
Net mill costs	7.705	10.51	11.63	11.04
Percentage of net mill costs				
Power	7.7	16.9	15.6	21.0
Carbon electrodes	18.5	12.5	n.a.	14.7

Source: "Aluminum, the Industry and the Four North American Producers," courtesy The First Boston Corp.

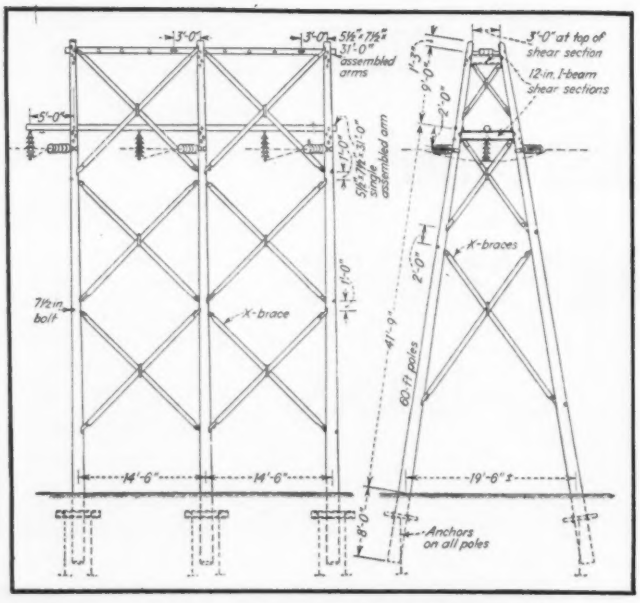
(1) Aluminium Limited, Arvida plant; (2) Aluminum Co of America; (3) Kaiser Aluminum & Chemical Corp; (4) Reynolds Metals Co

*Based on nine-months operation except for (1) whose costs are based on production January to June, 1949.

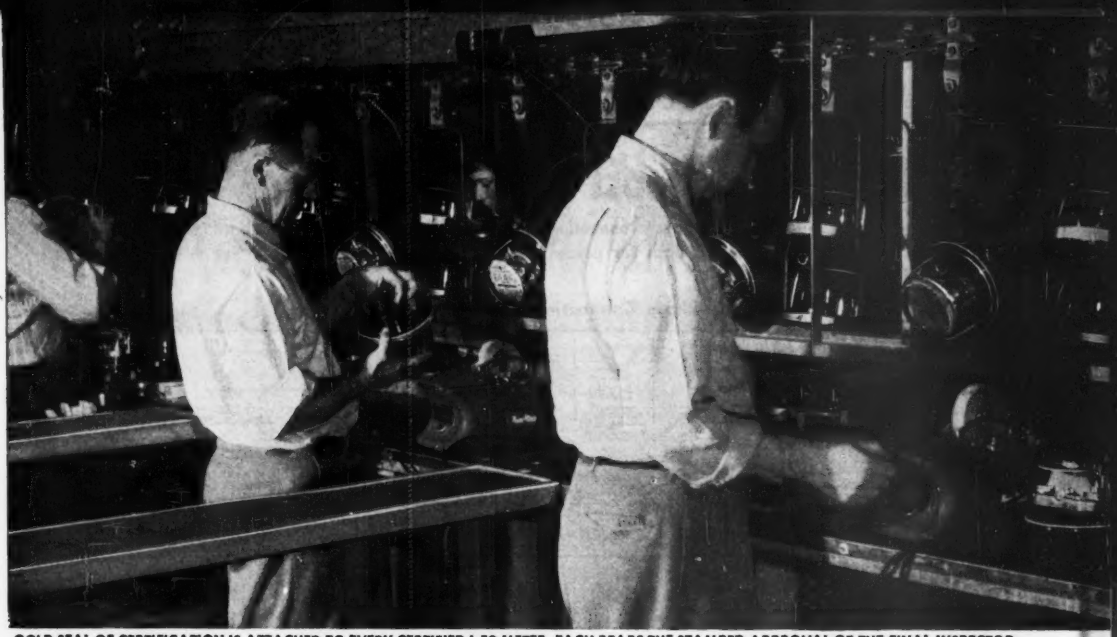
**After crediting revenue from sales of power to customers and deducting profits from subsidiaries.

n.a.—Not available.

Angle Structure Built Without Guys

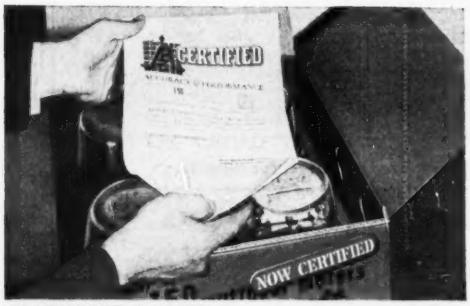


CROSS-BRACING on this six-pole structure takes the strain of a 90-deg angle on 69-kv line. Pole anchors are fastened below ground line to prevent pull-out. Lack of right-of-way space prompted Central Power & Light Co, Corpus Christi, Texas, to design a structure that did not require usual guys for angle construction



GOLD SEAL OF CERTIFICATION IS ATTACHED TO EVERY CERTIFIED I-50 METER. EACH BEARS THE STAMPED APPROVAL OF THE FINAL INSPECTOR.

I-50 WATTHOUR METERS NOW CERTIFIED



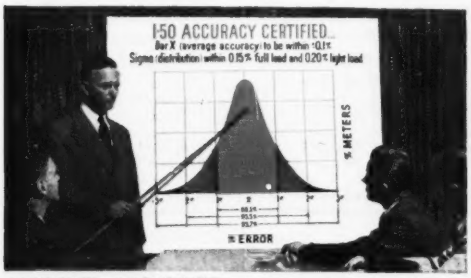
CERTIFICATE SHIPPED in each box is your assurance that I-50 meters are factory certified within prescribed limits.

General Electric factory certifies I-50 meters for both accuracy and performance

Only watthour meters accurate as I-50's can be factory certified within these narrow limits: Bar X (average accuracy) within ±0.1% and Sigma (accuracy distribution) within 0.15% on full-load and 0.20% on light load. Also, 99.9% free from defects that might cause improper registration or operation.

Certification of the I-50 is made possible only because of radical new design features, improved manufacturing techniques, and exacting quality control procedures.

You know that all types of meters are *not* alike—in either accuracy or performance. Why not evaluate and compare your own groups of meters? For complete information, call your G-E representative or write for descriptive bulletin GED-1408; Section 601-76, General Electric, Schenectady 5, N. Y.


I-50 ACCURACY CERTIFIED
Bar X (average accuracy) to be within ±0.1%
Sigma (distribution) within 0.15% full load and 0.20% light load
% METERS
% ERROR

CERTIFIED ACCURACY is based on standard method of group evaluation that reduces calibration data to two figures: Bar X (average accuracy) and Sigma (accuracy distribution).

CERTIFIED PERFORMANCE means all meters pass 18 electrical tests, including final tests shown above, and 356 points of inspection. Factory then certifies I-50 meters to be 99.9% free from defects.

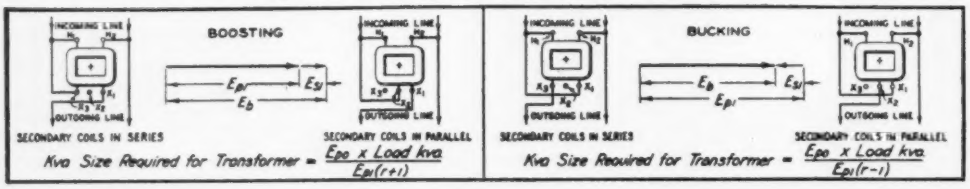
GENERAL ELECTRIC

601-76

Transformers to Boost or Buck Voltage

Diagrams show single and three-phase connections, as adapted from construction standards of San Diego Gas & Electric Co. Tabulated data for percent boost or buck will be given in an ensuing issue

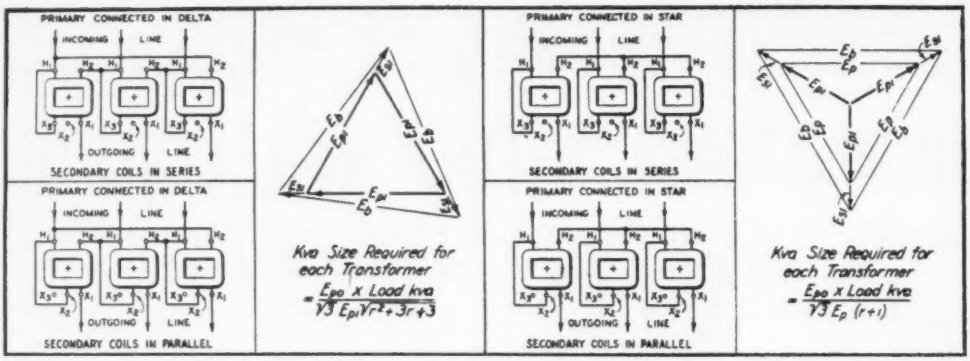
Single-Phase Connections for Boosting or Bucking



Kva Size Required for Transformer = $\frac{E_{po} \times \text{Load kva}}{E_{pl}(r+1)}$

Kva Size Required for Transformer = $\frac{E_{po} \times \text{Load kva}}{E_{pl}(r-1)}$

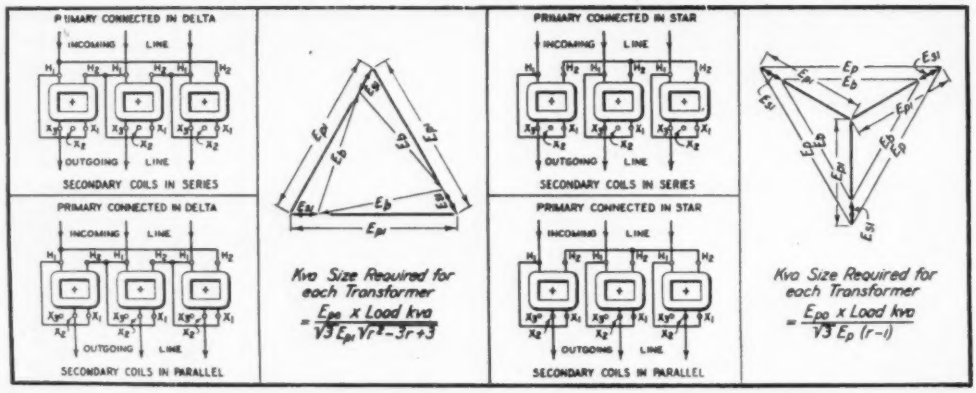
Three-phase Connections, Using Three Single-Phase Transformers for Boosting



Kva Size Required for each Transformer = $\frac{E_{po} \times \text{Load kva}}{\sqrt{3}\, E_{pl}\sqrt{r^2+3r+3}}$

Kva Size Required for each Transformer = $\frac{E_{po} \times \text{Load kva}}{\sqrt{3}\, E_p\,(r+1)}$

Three-phase Connections, Using Three Single-Phase Transformers for Boosting



Kva Size Required for each Transformer = $\frac{E_{po} \times \text{Load kva}}{\sqrt{3}\, E_{pl}\sqrt{r^2-3r+3}}$

Kva Size Required for each Transformer = $\frac{E_{po} \times \text{Load kva}}{\sqrt{3}\, E_p\,(r-1)}$

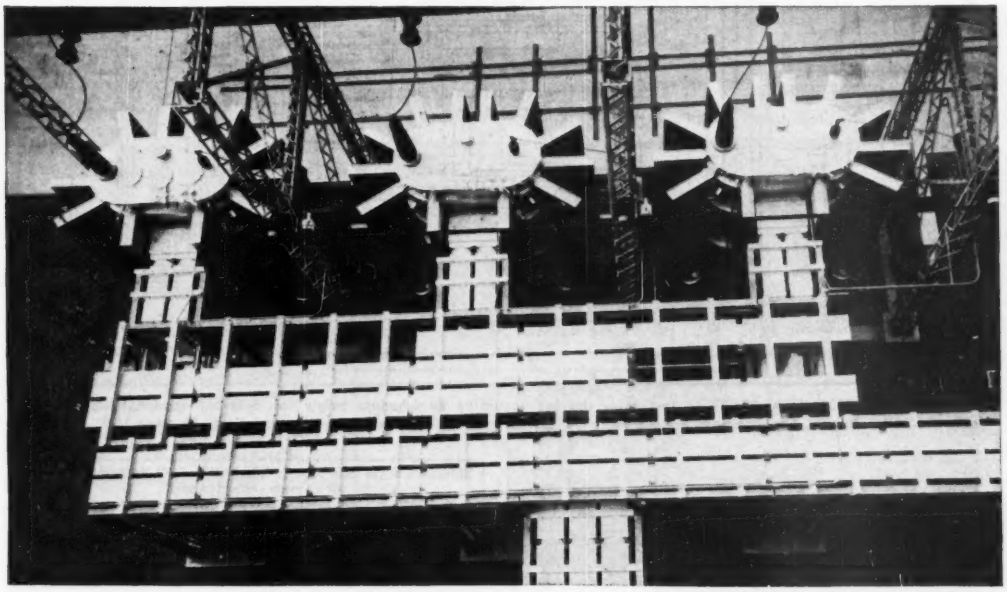
Note: Arrangement of letters identifying h-v terminals (H_1 and H_2), and l-v terminals (X_1, X_2 and X_3) shown in the diagrams are for Additive Polarity (+) transformers and are in accordance with the NEMA standards publication No. 42-73, May 1942.

L-v terminals (X_1, X_2 and X_3) on Subtractive Polarity (—) transformers read in reverse order to those shown above, X_1 (which is on the left) will remain the line lead for boosting and the primary to secondary tie for bucking.

NOMENCLATURE

E_b = boosted or bucked line voltage, phase-to-phase
E_p = primary line voltage
E_{po} = rated primary coil voltage
E_{pl} = primary coil voltage
E_s = induced secondary voltage
E_{so} = rated secondary coil voltage
E_{sl} = secondary coil voltage
r = transformer ratio = $E_{po}/E_{so} = E_{pl}/E_{sl}$

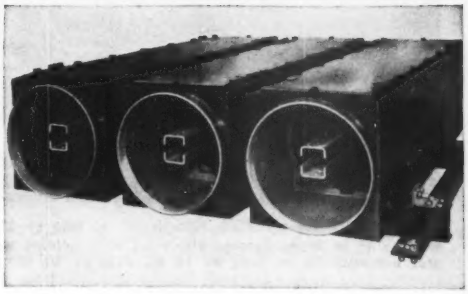
Vital Station Interconnections Get Maximum Protection



isolated-phase bus

With G-E isolated-phase bus runs for vital interconnections between generators, transformers and main switchgear, you know that every precaution is taken to insure freedom from faults of every type. Dust-tight, weather-tight aluminum construction seals out many possible causes of flashover. Advanced G-E design reduces the number of creepage surfaces without sacrifice of mechanical strength. Supplied in either individual-phase sections or as a complete three-phase package, G-E isolated-phase buses simplify installation problems and cut costs.

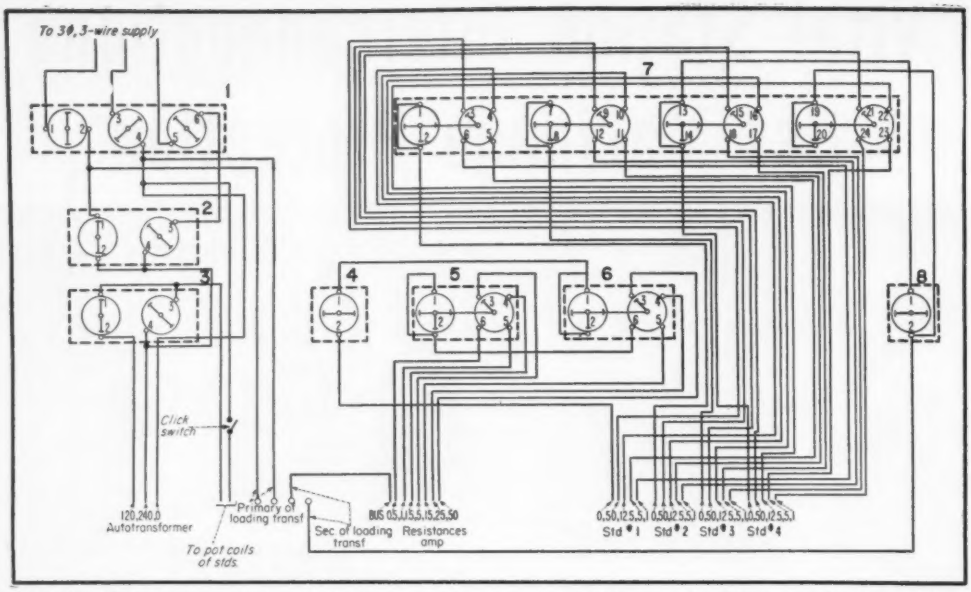
Your G-E sales representative has complete information. Ask him for a copy of GEA-5460, a 28-page publication that will aid you in planning your buses, or write to General Electric Company, Schenectady 5, N. Y.



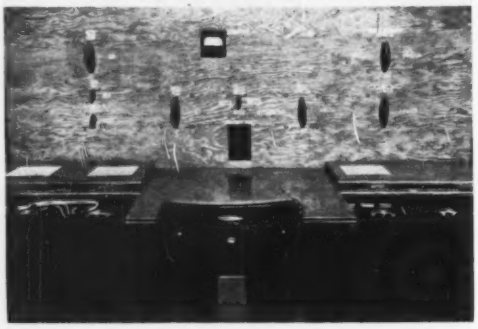
Typical three-phase section of G-E isolated-phase bus. Bus is copper, channel-type to provide maximum strength. Silver contact surfaces assure full flow of current and eliminate oxidation troubles. Insulators conform to NEMA standards, are normally carried in stock in power stations. Gasketed, aluminum cover has two sets of hinges to permit opening from either side. Lugs release covers without removal of any bolts. End bells are welded to housing. Adjacent ring flanges are tightly joined by split aluminum bands whose mating edges are also gasketed.

855-26

GENERAL ELECTRIC



EIGHT SWITCHES (bold numbers) on test table are set according to schedule below for different combinations of leads, currents and voltages. Specifications for the switches, including function, type, and rating, are listed on page 136



METER TABLE for standards tests is 57 in. long by 31 in. wide by 50 in. high. Permanently-wired wells holding standards are each 18 in. long by 10 in. wide by 12 in. deep

SCHEDULE OF SWITCH OPERATIONS FOR VARIOUS TESTS
("x" Denotes contacts closed)

Switch No.	1		2&3		4&8		5&6				7			
Positions	0°	90°	0°	90°	0°	90°	0°	90°	180°	270°	0°	90°	180°	270°
1		x	x			x		x	x	x		x	x	x
2		x	x			x	x	x		x	x	x		x
3		x		x			x				x			
4		x		x				x				x		
5		x							x				x	
6		x								x				x
7												x	x	x
8											x	x		x
9											x			
10												x		
11													x	
12														x
13												x	x	x
14											x	x		x
15											x			
16												x		
17													x	
18														x
19												x	x	x
20											x	x		x
21											x			
22												x		
23													x	
24														x

Contacts

Test Table for Rotating Standards Unifies Procedure

L. M. DONAHUE
Supt Electrical Meter and Maint Dept

K. W. PIERCE
Asst Meter Engineer
Central Vermont Public Service Corp
Rutland, Vermont

Periodic tests of watthour meter rotating standards are facilitated on the Central Vermont System by a conveniently arranged test table. The former set-up consisted of three rotating standards on a test table which were used for the purpose of checking and calibrating field and shop standards. After the 1947 flood, when much equipment, including some standards, was destroyed, we began using only one standard. Until last summer, all standards were checked yearly against this master.

An improved arrangement is provided by the test table now in use. It has three wells in which are set three specially calibrated standards. The bottoms of the wells are cushioned with rubber. Permanent leads within the walls to all coils of the standards avoid switching connections when using various coils and loads.

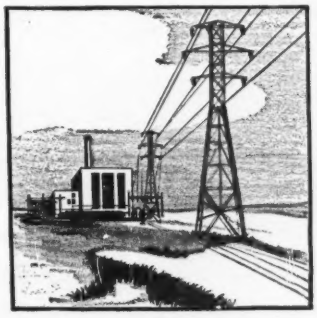
(*Continued on page* 136)

BUSINESS IN MOTION

To our Colleagues in American Business . . .

Like other suppliers, Revere offers its metals in a wide variety of alloys. This is for the reason that no one metal or alloy is suitable for every purpose, for every requirement. In order to help solve the sometimes complex problems that arise concerning metal specification, fabrication, and use, Revere offers the services of its Technical Advisory Staff. Here is an example of its work.

When an electric utility was re-tubing a condenser, Revere Research had an opportunity to obtain samples of the tubes that were removed. A laboratory examination showed them to be made of an excellent alloy; let us call it "Alloy X," since the tubes were made by a competitor. This alloy is usually specified for conditions of erosion-corrosion, but our examination indicated that the tubes also were subject to severe attack by air entrainment and high-velocity, turbulent water. The Revere Technical Advisor, who inspected the condenser in person, suggested that longer tube life might be obtained if cupro-nickel in the 10% nickel alloy were used. As a test, 50 such tubes were installed alongside the new "Alloy X" tubes.



At the end of only three months, the utility was disturbed to find that some of the "Alloy X" tubes were beginning to fail. Samples were sent to Revere Research, which once again reported that these competitive tubes were good ones, mechanically and as to alloy. The Revere Technical Advisor immediately returned to the utility, where he spent two days and nights on the job, much of the time inside the condenser itself. He found the cupro-nickel tubes in fine condition. Recommendations included putting a perforated iron sheet in the water box to reduce turbulence and air entrainment, and the use of 10% cupro-nickel tubes throughout. These suggestions were followed.

Two years later the cupro-nickel tubes were inspected, and found to be in excellent condition. As a result, a new generating station of the company was equipped with them.

Please note our statement that the tubes made by a competitor were all right as tubes. If Revere Tubes in the same alloy had been installed there, the same trouble would have been experienced. It was natural enough for the utility to blame the tubes, but Revere knows that if condenser tubes do not give long and economical service the fault most probably lies in the selection of an alloy unsuitable for operating conditions. In many cases, as in this one, Revere has been able to suggest changes in alloy or in operation, or both, bringing about important economies for users of condensers.

What Revere does in this way is not unique by any means. Suppliers in every industry do as much for their prospects and customers, every day in the week. They do it gladly, because a happy, satisfied customer is a precious asset. So we suggest that no matter what your business is, no matter what you buy, nor from whom, you take your suppliers into the closest possible confidence, permitting them to learn all they can about the conditions their materials have to meet. This will cost you nothing, and may save you much.

REVERE COPPER AND BRASS INCORPORATED

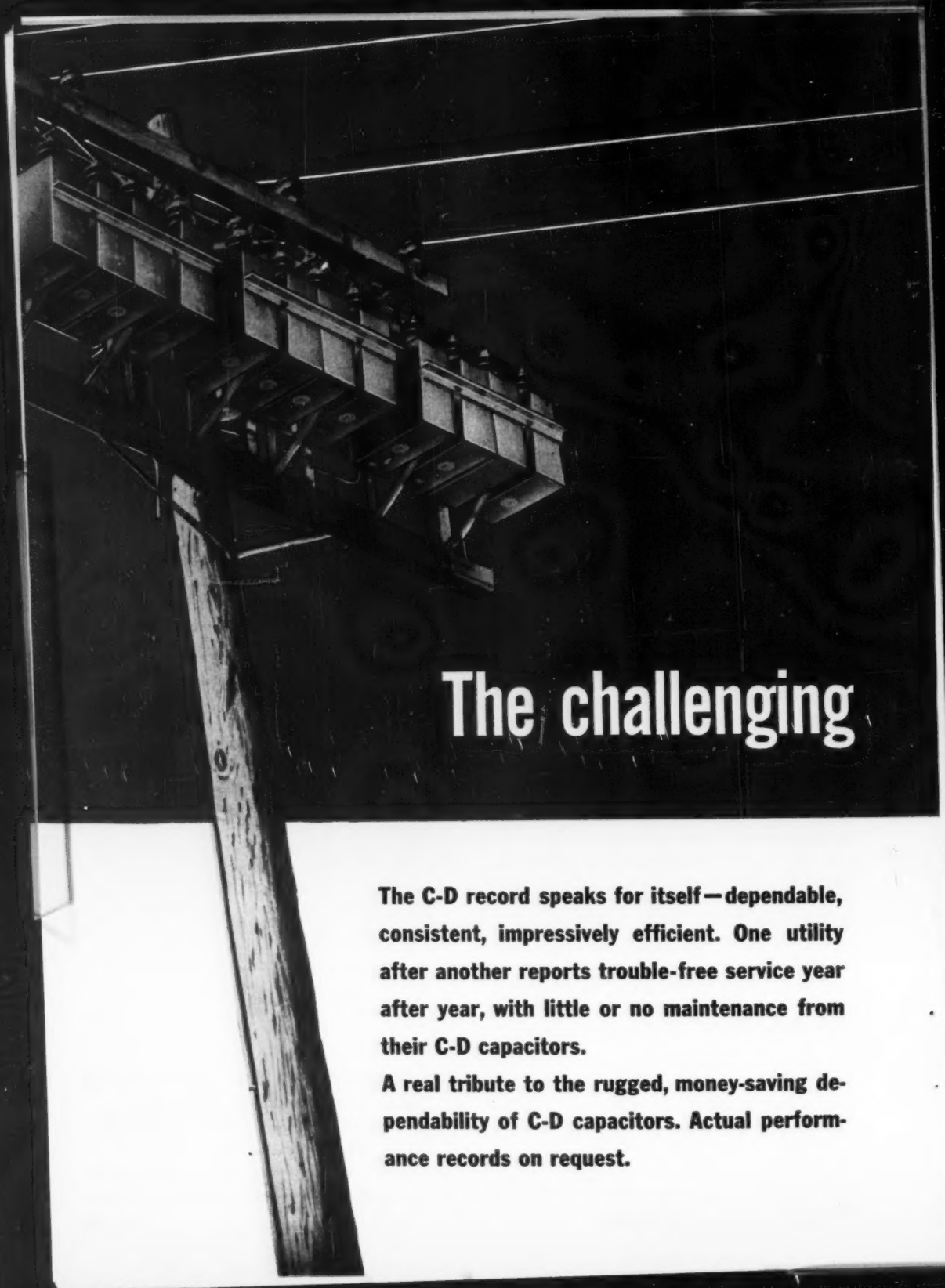
Founded by Paul Revere in 1801

150 YEARS SERVING AMERICA

Executive Offices:

230 Park Avenue, New York 17, N. Y.

SEE "MEET THE PRESS" ON NBC TELEVISION EVERY SUNDAY



The challenging

The C-D record speaks for itself—dependable, consistent, impressively efficient. One utility after another reports trouble-free service year after year, with little or no maintenance from their C-D capacitors.

A real tribute to the rugged, money-saving dependability of C-D capacitors. Actual performance records on request.

performance of C-D capacitors

These exclusive C-D features mean more value for your capacitor dollar:

- Case SAND-BLASTED for longer-lasting finish
- Solderless service connector
- Heavy-duty wet process porcelain bushings for longer creepage path, less breakage, higher impulse rating
- Wide margin between paper and foil provides higher impulse level
- Capacitor impregnated and case filled with non-inflammable, non-explosive Dykanol
- Use of C-D's Dykanol results in lower unit weight per Kvar; high stability; long life
- Many small sections in series-parallel results in low voltage gradient; no corona; lowest dielectric unit stress
- Only C-D capacitors (from 230 to 13,800 volts), are tested at full rated voltage for a period sufficient to establish ultimate heat rise

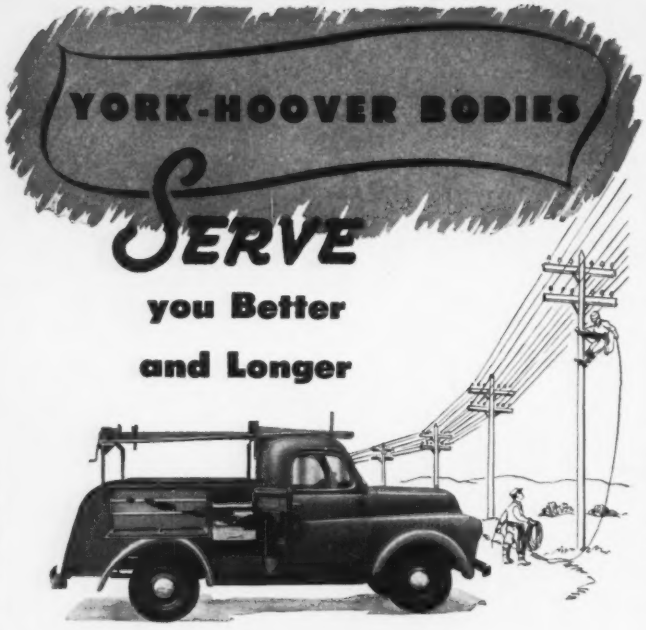
If you are considering an installation of industrial, station or pole-type capacitors for power-factor improvement, you can save maintenance dollars by talking it over with a C-D engineer. Cornell-Dubilier Electric Corp., Dept. D-61, South Plainfield, N. J.

1910-1951

CONSISTENTLY DEPENDABLE

CORNELL-DUBILIER CAPACITORS

PLANTS IN: SOUTH PLAINFIELD, N. J.; NEW BEDFORD, WORCESTER, CAMBRIDGE, MASS.; PROVIDENCE, R. I.; INDIANAPOLIS, IND.; FUQUAY SPRINGS, N. C. AND SUBSIDIARY: THE RADIART CORP., CLEVELAND, OHIO



HERE'S HOW

First, because York-Hoover Bodies are "job built." They're designed for your specific job. Second, because York-Hoover Bodies are made from the highest quality materials available. This means that when you equip your trucks with York-Hoover Bodies, both maintenance and operating costs are low . . . performance is high.

HERE'S WHY

Year after year, for over 50 years, York-Hoover customers have continued to place their confidence in our engineering and craftsmanship. To justify this confidence, York-Hoover "job built" bodies have maintained a high record of quality, performance and cost-saving efficiency. This is our contribution to the truck industry.

During the present period of National Emergency, York-Hoover's production facilities are taxed to the extent that deliveries cannot be made as quickly as normally.

We suggest that you contact us concerning your body transportation problems. We'll be glad to provide you with all the facts in detail, including earliest possible delivery dates.

York-Hoover Corporation
YORK, PENNSYLVANIA
Body Division

Test Table

(*Continued from page* 132)

The table is supplied with a 3-phase, 3-wire source from which can be obtained 240 v at power factors of unity and 0.5. A small autotransformer provides 120 v. The test table loading is of the phantom type providing 0.5, 1, 1.5, 5, 15, 25, and 50 amp. All switches on the board are quick-make and break. Any one of the four current coils can be selected simultaneously on all standards by means of a selector switch on the board. This avoids switching connections within the wells. The test table has a fourth well in which any standard can be placed for testing, calibration, or adjustment.

Switches Used in Test Table

Switch	Specifications
1.	Line switch; 2 pos.: on-off; triple-pole single-throw
2.	Voltage switch; 2 pos.: 120 v, 240 v; spdt
3.	Power factor switch; 2 pos.: 1.0 pf, 0.5 pf; spdt
4.	Load switch; 2 pos.: off-on; spst
5.	Load switch; 4 pos.: 0.5, 1, 1.5, 5 amp; sp4t
6.	Load switch; 4 pos.: light loads, 12.5, 25, 50 amp; sp4t
7.	Coil selector switch; 4 pos.: 1, 5, 12.5, 50-amp coil; 4p4t
8.	Shorting switch for fourth std, 2 pos.: 4 stds, 3 stds; spst

In practice, the three master standards are checked against each other weekly on at least four loads. These are 1.5 amp, 5 amp, and 15 amp, all at 120 v, unity power factor; and 5 amps at 120 v, 0.5 power factor. No readings are taken on the standards in this check until they have had at least 30 min warm-up with potential on the pot coils. Ten readings are taken at each of the above points, the average recorded and plotted. Since the standards were installed on the new test table, there has been an over-all variation of only 0.07% between them. Test conditions have been uniform for loading, connections, and procedure.

For testing shop and field standards a new schedule has been set up under which each standard will be checked semi-annually on the new test board against the three master standards. A steady flow of standards is provided for on the basis of about one per week. Steps have been taken to accumulate and study complete histories of all our standards. All new meters arriving in Rutland are acceptance-tested. The only testing done in our various division shops is complaint and periodic testing of meters

(*Continued on page* 141)

HI-TENSION NEWS *Junior*

How Important is *Tolerance* in a Lightning Arrester

To listed average lightning arrester ratings must be added manufacturing tolerance in order to evaluate arrester performance. How important is this tolerance?

Bear in mind that tolerance in a lightning arrester can come from only one place--the Protective Margin. Every per cent of tolerance *added to* catalog averages is *deducted from* the protection afforded apparatus. There are times when you have little protection to waste.

O-B Thorex lightning arresters have the exceptionally low tolerances of +10 per cent sparkover and +5 per cent IR discharge voltages. These close tolerances in combination with low average values leave a substantial Protective Margin available for working use. Protection is what you buy in a lightning arrester, and Thorex tolerances combined with low average values make more of this available.

Leaving out all other Thorex advantages, for the above reasons alone, you should investigate this radically improved arrester.

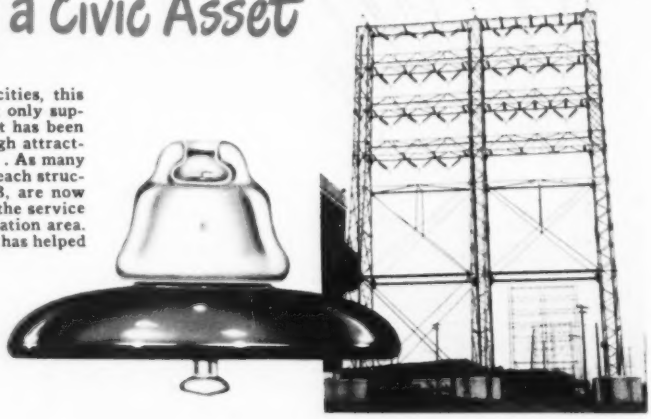
Ohio Brass

MANSFIELD, OHIO, U.S.A.

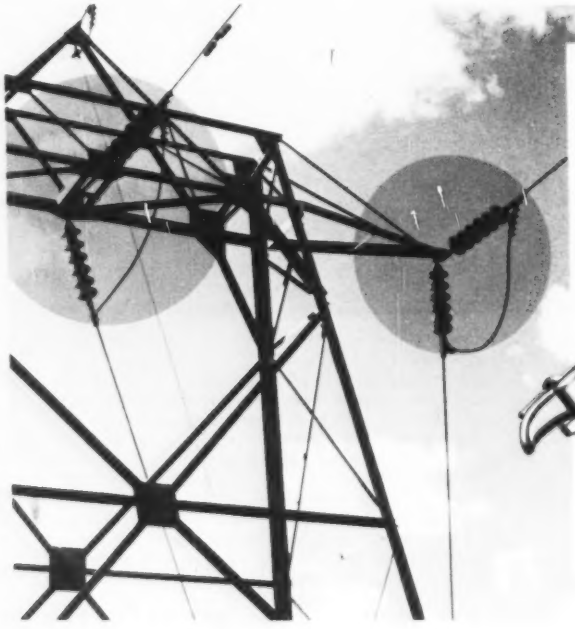
(B)

HI-TENSION NEWS *Junior*

Helping Build a Civic Asset



Encircling one of our large Midwest cities, this high voltage distribution "ring" has not only supplied ample power to local industry, but has been credited with developing the city through attracting additional commercial enterprise. . . . As many as 256 suspension insulator units are on each structure. These insulators, supplied by O-B, are now nearly 30 years old. The very nature of the service places the insulation in a high contamination area. Yet the performance of these insulators has helped to make a record of reliability that has made this "ring" justly famous, and has turned it into a valuable civic asset. . . . Owners of this system have expressed their estimation of O-B insulation in the most concrete way -- by year-in, year-out continued use. This may be one of many sound reasons for making O-B *your* CHOICE OF INSULATORS.



No More Spliced Jumpers

New 22-kv Post Equipped with Clamptop

● With the introduction of the new 8⅓-inch O-B Clamptop line post, you can now use the popular post type insulator, plus the modern improvement of the Clamptop head, on all classes of construction from 22 to 69 kv. . . . This new size O-B post is the first combination of the pillar-shaped insulator and Clamptop head made available for 22-kv construction. . . . The modern Clamptop eliminates all tie wires and, with them, the insecure grip and troublesome serve typical of hand ties. Hot line work with the Clamptop is easy and fast, and is done at no sacrifice of conductor-holding power. Loose ends of energized tie wires, once a hazard to hot crews, are eliminated. . . . Add the handiest and best tie attachment to one of the most popular post sizes and you have the new O-B Clamptop line post. Include these in your construction standards.

● How can a strain clamp improve the conductivity of a transmission line?--by eliminating high resistance jumper splices at deadend points. . . . O-B Hi-Lite clamps permit stringing conductors straight through strain points without cutting, thus forming jumper loops with continuous cable. They install in only a minute or two and require no more field equipment than a common hand wrench. No special training of linemen is needed, and no more than common-sense care is necessary to get an attachment that will develop the full working strength of the conductor without slip. At any time, clamping power is easily and positively inspected. . . . In addition to a real saving in construction cost, O-B Hi-Lite strain clamps make possible continuous jumper loop construction with all of its operating advantages. Specify these clamps in your new plans.

Black and White Facts on Performance

You can be sure of a lot of things about a station insulator when it is new--dimensions, strength, and dielectric qualities; all of which are covered by standards. But the one thing you want the most--durability--never reveals itself until the *last day* of the insulator's life. Then, you can count up years of service, and only then! . . . Most station insulators are very much alike on the *first day*, but it's a different story as the years roll by. . . . This fact is significant--most requirements for O-B station insulators come from present users. These companies have their own records where the facts are in black and white, and these records prove that, for what you want the most, and can't specify --performance--turn to O-B.

Ohio Brass

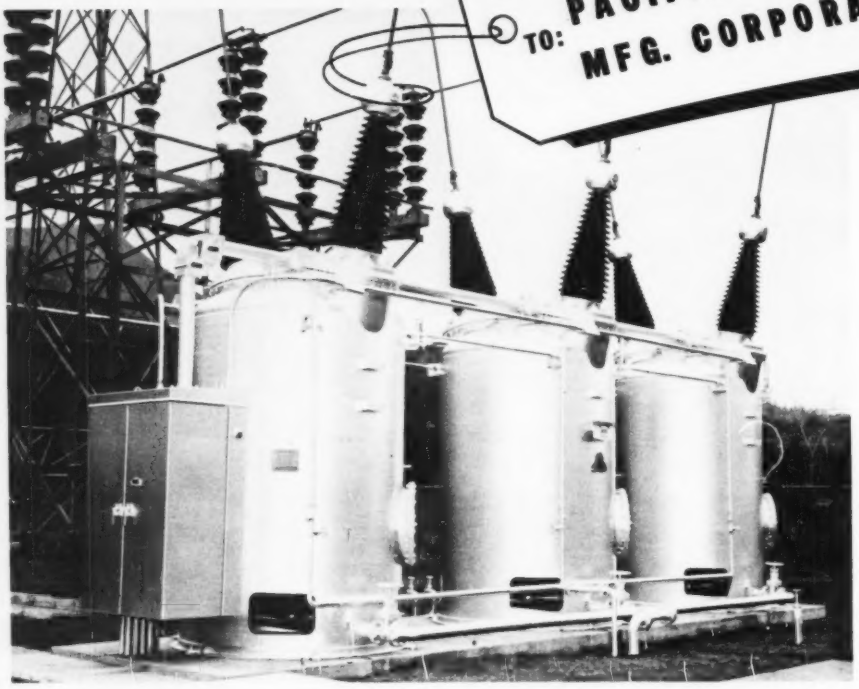
MANSFIELD, OHIO, U.S.A.

OB

HI-TENSION NEWS *Junior*

OHIO BRASS COMPANY
BARBERTON DIVISION - BARBERTON, OHIO, U.S.A.

TO: PACIFIC ELECTRIC MFG. CORPORATION



● One of several three-phase oil circuit breakers supplied to a large Western system by the Pacific Electric Mfg. Corporation. According to the apparatus builder . . . "These breakers are designed for operation on 230-kv lines, have an interrupting capacity of 7,500,000 kva, and carry 1200 amperes continuously. Interrupting time is 3 cycles, closing time 10 cycles, and reclosing time is adjustable as desired from 15 to 45 cycles. Sliding-shoe contacts require no critical adjustment to fix closed position, nor is contact pressure affected by contact wear. Other Pacific Electric features include closing by stored energy of motor-compressed springs, improved arc extinguishment." And . . .

BUSHINGS

one of the finest components of any circuit breaker-

Ohio Brass

MANSFIELD, OHIO, U.S.A.

4128-H

Test Table

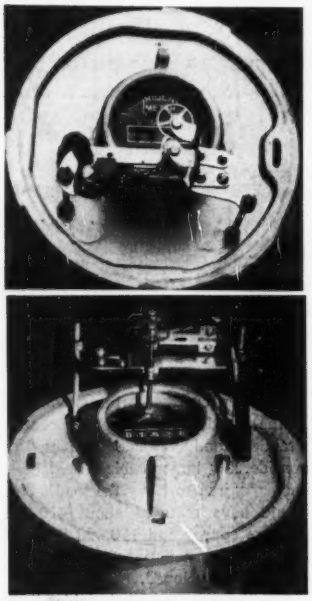
(*Continued from page* 136)

from the field. A carefully calibrated master meter of the watthour type is used in each area for approximate indication (within ±0.2%) of the local standard's accuracy during periods between its semi-annual calibration against master standards in Rutland.

Fluid Meter Attachment Has Various Applications

GEORGE W. UNANGST
Charleston District Meter Supt
and
B. R. CURRENCE
Meter Man
Appalachian Electric Power Co
Charleston, W. Va.

This attachment to a fluid meter records or indicates at remote points the amount of water or other fluids used, or it will cause local meters to



REMOTE-CONTROL CONTACTOR, attached to water meter register, produces electrical impulses which operate electric indicating or recording meters, counters, alarms, or electrically operated valves

operate a counter, relay, valve or alarm. The attachment illustrated was developed jointly by the authors and has been used to record water usage during 30-min periods.

The responsibility of public utilities to provide dependable service 24 hours a day is taken for granted by every customer who pays his bill. Only "acts of God" excuse the company for failure to do so.

Financially, a transformer fire is unimportant, but the resulting black-out of power and light service to homes, hospitals, defense plants and municipal properties may well prove tragic. Protect your customers by protecting your transformers with a

Deluge Systems, Wet Pipe Systems, Dry Pipe Systems, Water Spray and Fog Systems, Rate-of-Rise Sprinkler Systems, and Foam and Carbon Dioxide Extinguisher Systems.

BLAW-KNOX
AUTOMATIC FOG SYSTEM

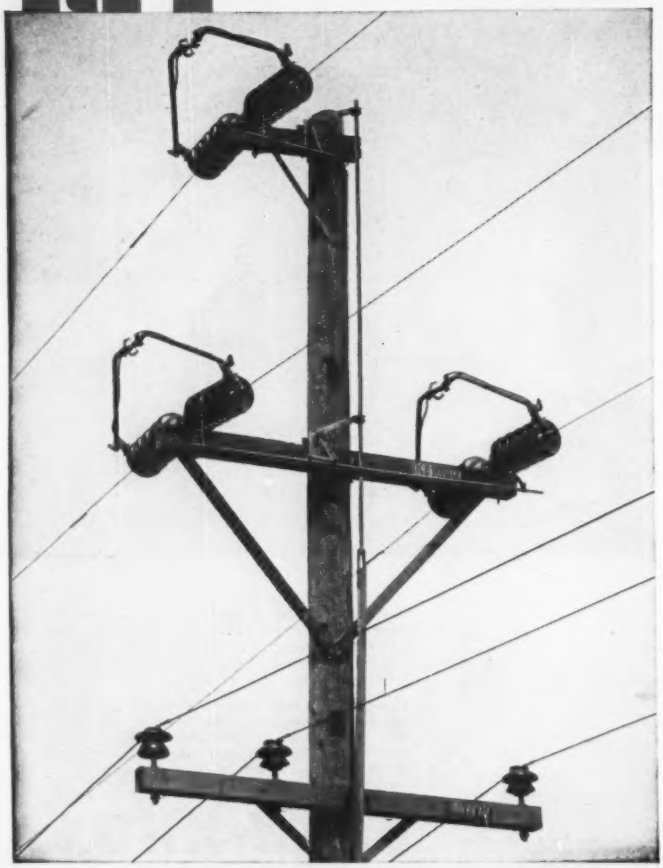
Through fast-acting rate-of-rise thermostats, any critically hot transformer is instantly blanketed with a heavy, quenching "fog" of water, confining the damage and protecting adjacent areas . . . materially reducing power failures in both frequency and extent. Without obligation Blaw-Knox engineers will survey your fire hazards, make a layout of the most efficient system and estimate costs. Blaw-Knox Fire Protection Systems carry the approval of all underwriters.

"LITTLE JOEY SPRINKLER"

BLAW-KNOX SPRINKLER DIVISION
OF BLAW-KNOX CONSTRUCTION COMPANY
829 Beaver Ave., N.S., Pittsburgh 33, Pa.
Offices in Principal Cities

BLAW-KNOX FIRE PROTECTION SYSTEMS

KPF **POLE TOP SWITCHES**



Simple design
means economical installation

Bore two holes in a single crossarm, tighten two bolts, attach the conductors, and the switch is installed! No separate dead-ends, no "extra" insulators required. Saves man hours, saves installation costs.

Simple design also means lower first cost, less maintenance. Insulator stacks are readily adjustable for line sag. Free-floating, self-aligning, silver-surfaced blades and jaws maintain proper contact under all conditions of sag adjustment. Switches can be used in vertical, horizontal or triangular mountings. The low-cost, trouble-free service rendered by KPF switches is attested by the many thousands in use throughout the world.

KPF **ELECTRIC COMPANY**
857 Howard Street • San Francisco 3, Calif.

In essence, the device is a contactor activated by cams driven by a geared shaft that can be readily attached to the water-meter register.

To apply the device to a fluid meter, remove the cover, mount the contactor, and connect its shaft to the meter register. This connection is made by a slotted shaft or one with a finger or fork turned by the meter register.

For V-type meters, a type D-13 contact device for V-type G. E. meters is used in conjunction with one additional mounting bracket for the drive shaft. A gear is attached to the top of the drive shaft to engage the camshaft gear. Gear ratio depends on the desired relationship of the register speed and contactor operation.

The entire device is mounted on a base plate which may be readily attached to the fluid meter housing. Any all-metal base plate from a socket type watthour meter will be suitable if a hole is cut in the center to fit over the fluid-meter register housing. Two holes drilled in this base permit attachment to register housing.

Segmented Conductor Saves Scarce Metals

C. E. BETZER, Senior Engineer
Line Design Division,
Engineering Department,
Commonwealth Edison Co, Chicago

In cooperation with cable manufacturers, this company has developed a conductor for 69-kv oil-filled cable consisting of four segments. It is the first use of the segmental type in a conductor having an oil channel through the center. This cable makes possible the use of a smaller conductor for a given current carrying capacity. If the standard design of concentric stranded conductor had been used, a considerably larger cable would have been required to carry the load. This would have required about 410,000 lb more copper and 150,000 lb more lead on the installation for which this cable was developed.

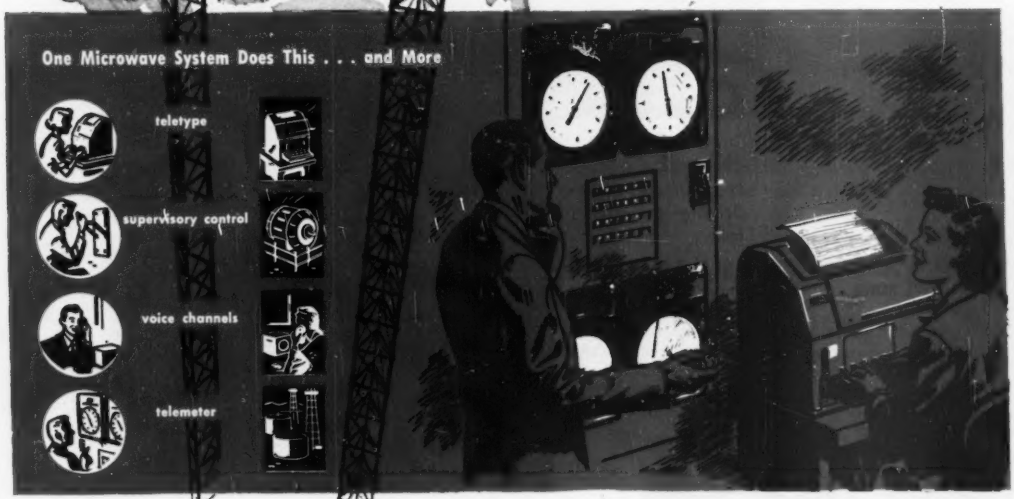
For 138-kv, oil-filled cable lines now being planned, a conductor designed in six segments is to be used. Copper size is to be 2,250 Mcm, whereas with former concentric stranded type of conductor, copper size would have been about 2,800 Mcm. Saving in metals for 212,000 ft of cable amounts to about 360,000 lb of copper and 170,000 lb of lead.

Motorola microwave

Multiply your present communication facilities, realize new economies, and make sure of the greatest possibilities for future expansion, by insisting on a MOTOROLA, superior-engineered Microwave System.

With the most *private-owned* microwave mileage now in operation, Motorola offers you the benefit of EXPERIENCE, *plus* many immediate and practical advantages.

Operating in the proven 6000 Mc. frequency band, Motorola Microwave provides maximum effective power gain. The superior frequency-division multiplexing system provides optimum reliability. All your electronic equipment is at ground level for fast, precision maintenance.



Installations

Aeronautical Radio Incorporated
State of California
Pan American Pipeline Co.
Shell Pipeline
Panhandle Eastern Pipeline Co.
Texas Illinois Natural Gas Pipeline Co.
Mid-Valley Pipeline Co.
Brazos River Electric Transmission Cooperative
City of Dayton, Ohio
Michigan State Police

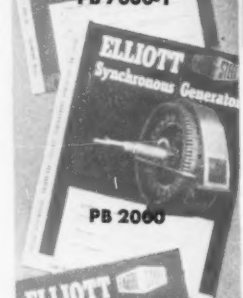
Motorola Microwave is the super communication "pack horse" of complete round-the-clock reliability. Cross-town or cross-country, office to plant—to branch—to mobile crews, it provides multi-channel facilities for voice circuits, supervisory control networks, telemeter, and teletype, 2-way radio tie-in, with innumerable additional combinations for automatically and simultaneously operating your entire system. Motorola Microwave means efficient, economical point-to-point communication.

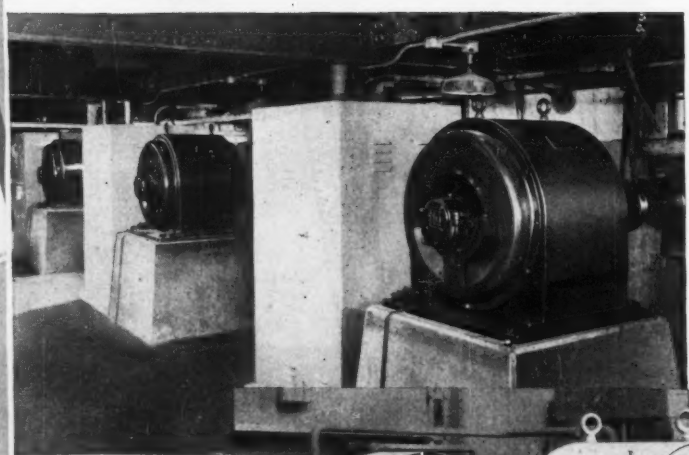
Motorola COMMUNICATIONS AND ELECTRONICS DIVISION

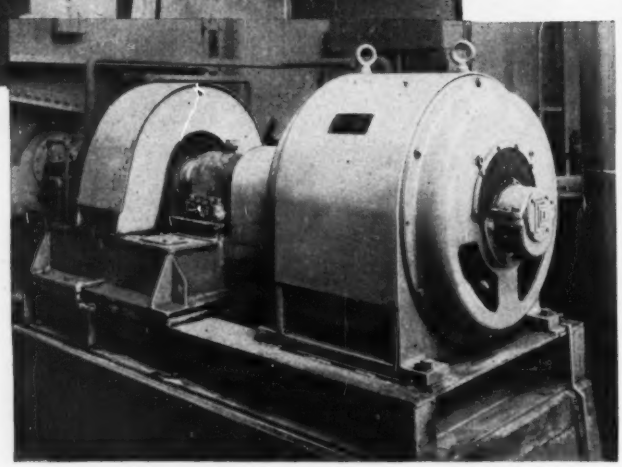
4545 Augusta Blvd., Chicago 51, Illinois

World leaders in FM 2-way radio communications • 2-way mobile • portable • microwave • carrier and control • supervisory control equipment

Large ELLIOTT motors do the Big Jobs



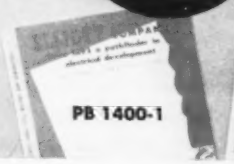




Three of six 250-hp, 1200-rpm motors driving pulverizer mills.

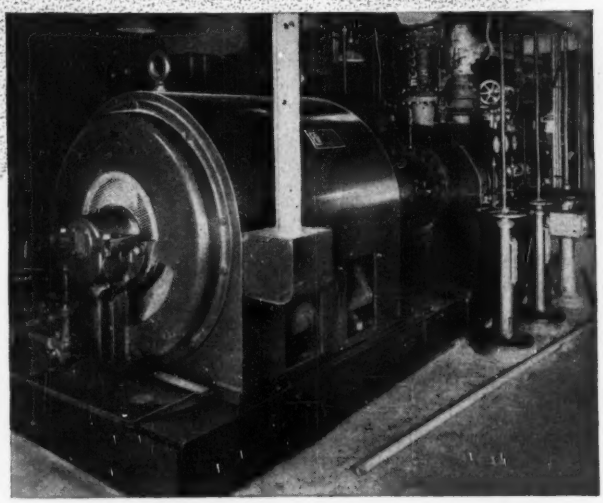
Six motors like this drive forced-draft fans. They are 450-hp, 1200-rpm. There are six more motors driving induced-draft fans.

Elliott
FABRI-STEEL
MOTORS AND GENERATORS



in Central Stations!

AT ILLINOIS POWER COMPANY WOOD RIVER POWER STATION



One of the four 1250-hp, 3600-rpm, drip-proof motors that drive boiler-feed pumps.

In addition to the motors shown, Elliott has supplied motors for driving main boiler auxiliaries for three more units at Illinois Power Company, Wood River Power Station.

Men who know tell us these motors *look* like what they are—smooth, quiet, *competent* performers on important central station drives where rugged reliability is a *must*.

There are good reasons for this. Elliott Fabri-Steel construction brings to big motor design the crack-proof, break-proof stiffness of modern fabricated steel, providing the vitally essential rigid maintenance of air gap.

But that is only part of the story. Fabri-Steel construction for the first time blasts aside the many limitations of old-type construction, enabling Elliott engineers to meet all requirements of motor service, with designs ideally suited to the individual case — and what is almost more important, to effect an easy accessibility that cuts a huge slice from normal maintenance costs.

GET THE FACTS . . .

The bulletins on these two pages are waiting for your request.

ELLIOTT COMPANY

Ridgway Division • ***Ridgway, Pa.***

Dept. ER.

Plants at: JEANNETTE, PA. • RIDGWAY, PA. AMPERE, N. J. • SPRINGFIELD, O. • NEWARK, N. J.

DISTRICT OFFICES IN PRINCIPAL CITIES

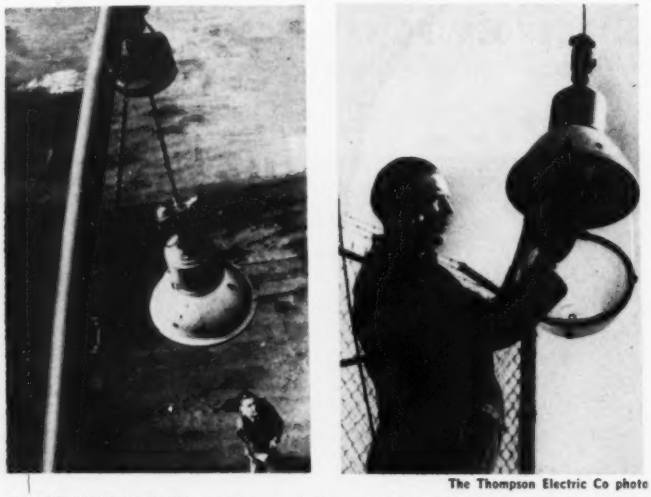
L-814

HALF CENTURY OF POWER PROGRESS 1901 Elliott 1951

Protective Lighting Fixture Hangers Cut Maintenance Costs

Outdoor disconnecting and lowering lighting fixture hangers are effecting savings in time, cost, and hazard of lamp and fixture maintenance at the Ivanhoe Road, Cleveland, Ohio, plant of the Perfection Stove Co. These hangers provide for rapid and safe luminaire maintenance at ground level and are being utilized on luminaries and floodlights lighting the entire parking lot, all drives, and building walkways. Climbing ladders to service these lights which are more than 25 ft above ground level is made most hazardous by the presence of automobiles and high fences surrounding the parking area.

This installation utilizes standard two-pole outdoor hangers incorporating deep canopies which protect the lighting fixture and its connections from the weather. The individual light poles employ from three to six hangers, each of which is controlled independently from ground level and can be lowered for servicing. Since the lowered fixture is "dead," there is no electrical hazard for the maintenance worker cleaning or relamping the unit. Fast servicing now possible has substantially lowered maintenance costs and increased efficiency.



The Thompson Electric Co photo

MAINTENANCE TIME is cut by use of disconnecting and lowering hangers on outdoor protective lighting luminaires and floodlights. Ladder and electrical hazards are eliminated with servicing and relamping at ground level with "dead" fixture

INDUSTRIAL BRIEFS

Planned Lighting boosts production and employee moral and reduces spoilage at the Hill Acme Co, Cleveland. Continuous rows of 2 lamp (85-w) fluorescent units mounted on 10 ft centers at 17 ft mounting height provide 50 ft-c of glare-free shadowless light at working levels in the side bay areas of the plant. Westinghouse Electric Corp.

Modernized Lighting has improved operating conditions in the weave room at Broad Brook Company, Broad Brook, Conn. Rejects have been reduced and maintenance simplified. Inspection of material in process and scrutinizing of loom mechanisms under 57 ft-c have been made easier and more comfortable. General illumination of 15 ft-c increases safety in movement of employees and material in working areas. Warp inspection areas have two-lamp industrial fixtures mounted 42 in. above work level. Connecticut Light & Power Co.

Paint Drying in infra-red oven of mortar shell containers at Standard Container, Inc, Rockaway, N. J., saves time and floor space. Installation and maintenance cost was low. Entire baking cycle is about 1½ min. Flexibility of design permits possible changes if required. Uniform heat eliminates rejects on rigid inspection tests for olive-drab finish. First zone has 500-w, middle zone 375-w, and last zone 250-w lamps. Total load is 105-kw. Oven is horseshoe shaped with ventilating hood and fan to remove fumes and moisture from system.—S. Burck, industrial engineer, New Jersey Power & Light Co, Dover, N. J.

Heat-Treating shuttle tips by induction heating at Charles A. Richardson, Inc, West Mansfield, Mass., has increased production from 1,000 to 3,000 tips per man-hour. Entire operation is fully automatic and exact degree of hardening is accomplished in certain areas of the tips, while other areas remain soft as desired. With the oil-fired pot furnaces previously used, rejects were very much higher.—General Electric Co.

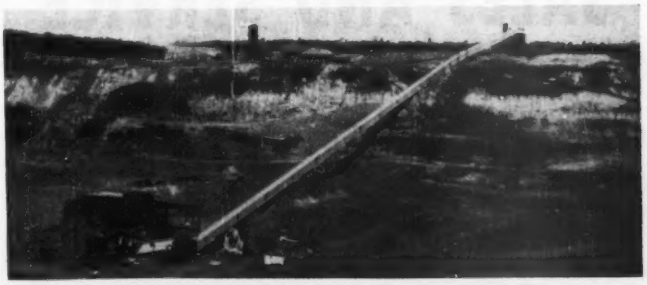
New Conveyor Drive Saves $8,000

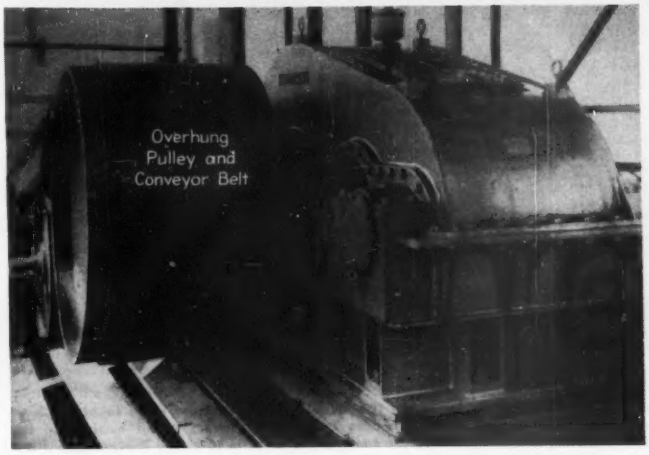
The first overhung conveyor installation made on the Iron Range in Minnesota is said to have saved over $8,000 in installation cost alone. It is believed to be the first conveyor of its type to be installed anywhere. A second installation now is under way on the Iron Range.

New drive uses an overhung driving pulley, eliminating the conventional head shaft and its bearings, as well as the low-speed coupling or chain drive. This eliminates maintenance on head shaft bearings and the low-speed coupling. This coupling has been one of the major sources of belt conveyor shut-downs.

This design uses a special speed reducer. It is equipped with an extra large gear shaft and special antifriction bearings, to provide the extra capacity necessary for overhanging the driving pulley. Taper-hardened gearing and pinion shafts, plus fabricated steel housings, make possible a unit of minimum size and weight.

Drive was developed by the National Iron Co, Duluth, Minn.; the special speed reducer was built by Westinghouse Electric Corp.





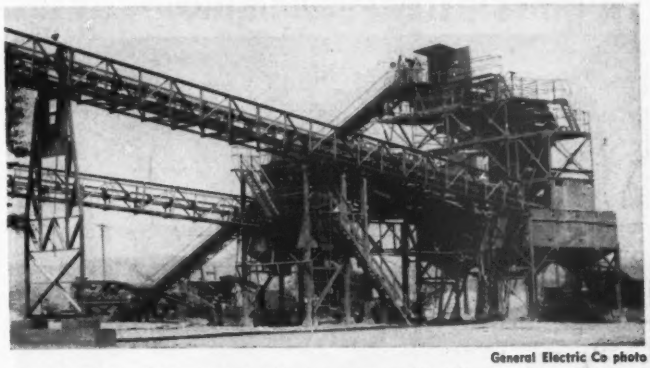
OVERHANG CONVEYOR DRIVE saved $8,000 in installation costs alone, reduced maintenance and costly shut-downs

This All-Electric Aggregate and Batch Plant Is Portable

One of the few portable aggregate and batch plants in the United States is being operated by Western Contracting Corporation, Newman, California. Completely equipped with electric motors and control, the plant has a capacity of 245 tons of specification aggregate per hour and is designed and constructed so that it can be disassembled and moved to new job locations.

Originally built to supply highway paving aggregate, the plant was moved to Westly, California, to produce aggregate for the Delta-Mendota Canal. It was then moved to its present site near Newman, California, a distance of about 20 miles, where is was assembled and placed in operation in only 10 days.

The motors range from 7½-hp speed reducers which drive the conveyor belts to a 150-hp motor which operates a rock crusher at the beginning of the conveyor system. In addition to the motors which drive the conveyors and other machinery, a 75-hp vertical motor operates a deep well pump supplying the plant with water. All motors are interlocked.



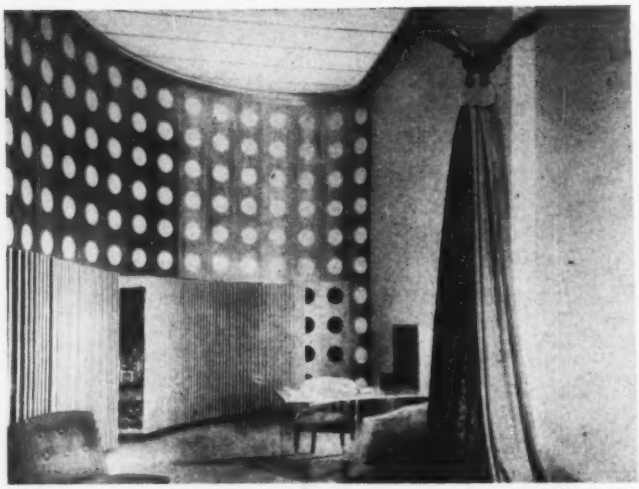
General Electric Co photo

COMPLETELY ELECTRIFIED portable aggregate and batch plant has capacity of 245 tons of specification aggregate per hour and is designed and constructed so that it can be disassembled and moved to new job locations

SALES AND SERVICE

RESIDENTIAL • RURAL COMMERCIAL

Cold-Cathode for Glass Ceiling



Colonial Electric photo

BECAUSE of its height and construction, the light source above the milky glass ceiling in the fabric show room of the Meadox Sales Co, New York, should require minimum replacement. For this reason cold-cathode was selected because of its comparatively longer life. Also the low surface brightness of the cold-cathode tube serves to make the ceiling appear as a continuous and uniform source of light

Fixtures Pass Through Partitions

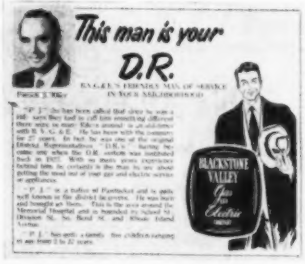
Sylvania Electric Products Inc photo

CONTRIBUTION TO ECONOMY in the relighting of the office of the Ciba Pharmaceutical Co in Summit, N. J., was the running of continuous rows of fixtures through apertures cut in partitions instead of separate fixture groups in each room. The paired 8-ft T-12 Slimline lamps in the 3 rows provide uniform intensity of 50-55 ft-c

Quarter Century Proves Success of "D.R." Plan

Many complaints are nipped in the bud before growing to irritant proportions. Rate agitation has been almost nil for years. Helpful advice on maintenance and repair keeps appliances in operation, and regular calls are effective in selling them. Customer relations are personalized and thus kept from souring. These are some of the general reasons why, with 25 years of successful operation behind it, the customer representative plan of the Blackstone Valley Gas & Electric Co is still going strong.

Each representative is the company to the customers in his assigned district—hence the appellation, "D.R." —and is the exponent of customers' views, impressions, and wishes to the company. He reads meters, not at here-again-gone-again speed, but with



HELPFULNESS TO CUSTOMERS is the theme of "D.R." advertisements

time for a friendly word or two. He invites comments that may disclose small dissatisfactions with service that can be corrected before they grow into big ones. He sells appliances, not at high pressure, but with a knowledge of the customer's needs and circumstances gained from continuous neighborly contact.

The Blackstone Valley company has some 54,000 residential electric and 46,000 gas customers. There are now about 43 "D.R.'s". The number of

(*Continued on page* 152)

HAVE YOUR CUSTOMERS READ THIS "BEST SELLER"?

SEE YOUR HOME IN A NEW LIGHT
22 Recipes for Better Living in a Better Lighted Home
WITH LIGHT CONDITIONING FOR ALL
GENERAL LIGHTING

Now... almost 2 million copies in circulation! Nearly 100 Electric Service Companies distributing it!

ALREADY, close to 2 million copies of General Electric's new lighting recipe booklet have been placed in the hands of the public. Offer of the booklet on the Fred Waring Television show, in spot radio commercials and magazine ads has produced many additional thousands of requests.

"See Your Home in a New Light" is sure-fire! Make the most of its tremendous appeal by using it to promote "Light-Conditioning" in your community. Prepared by General Electric home lighting specialists, the new book covers every major home lighting situation.

22 recipes give detailed information on lighting, such as exact measurements for lamp placement, for every purpose in the home.

General Electric is making the lighting recipe booklet available to electric service companies at nominal cost in any quantity you require for broad distribution. For full information and suggestions on methods of distributing it, call your G-E Lamp District Office. General Electric Company, Lamp Department, Nela Park, Cleveland 12, Ohio.

GENERAL ELECTRIC

MORE POWER FOR AUTO ASSEMBLY PLANT

These special machines wind a pair of high voltage disc coils simultaneously with uniform tightness from a continuous conductor. This method eliminates connections at the center of the double coil. Coils are stacked, clamped, and brazed together. Uniformly placed spacers are cemented between the coils, giving good mechanical support without impeding circulation of the coolant.

Two of eight ovens designed specially for high velocity drying. Air is completely circulated every two minutes and changed every four minutes. The core and coil assembly is baked until completely dried and checked by power factor and megger readings. After drying, all bolts are tightened and the assembly is immediately placed in insulating liquid in its own tank.

Radiators are made corrosion-resistant by a 5-step bonderizing process and then rotary flow painted.

On the right is a radiator being hoisted from the oven after baking for 15 minutes at 350°F. This produces a smooth, tough surface that resists industrial atmospheres and severe climatic conditions.

Consumers Power Company of Michigan Installs Two More Allis-Chalmers Transformers Into State-Wide System

POWER TO RUN machine tools and motors, to move assembly lines . . . power to produce thousands of automobiles each week is supplied by this pair of 10,000 kva Allis-Chalmers transformers. They supply economical power for a large auto manufacturing and assembly plant in Michigan.

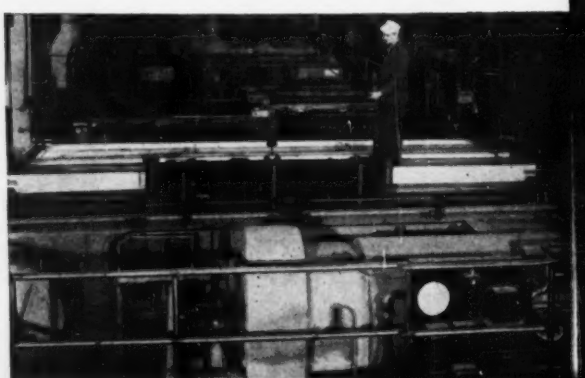
These transformers, installed by Consumers Power Company, are designed to have a low rate of depreciation and low maintenance cost. For over a quarter of a century, Allis-Chalmers power and distribution transformers have met the exacting standards of the Consumers Power Company's state-wide system that supplies 1,000,000 kw to 56 Michigan counties. These new transformers will help make satisfied customers for years to come.

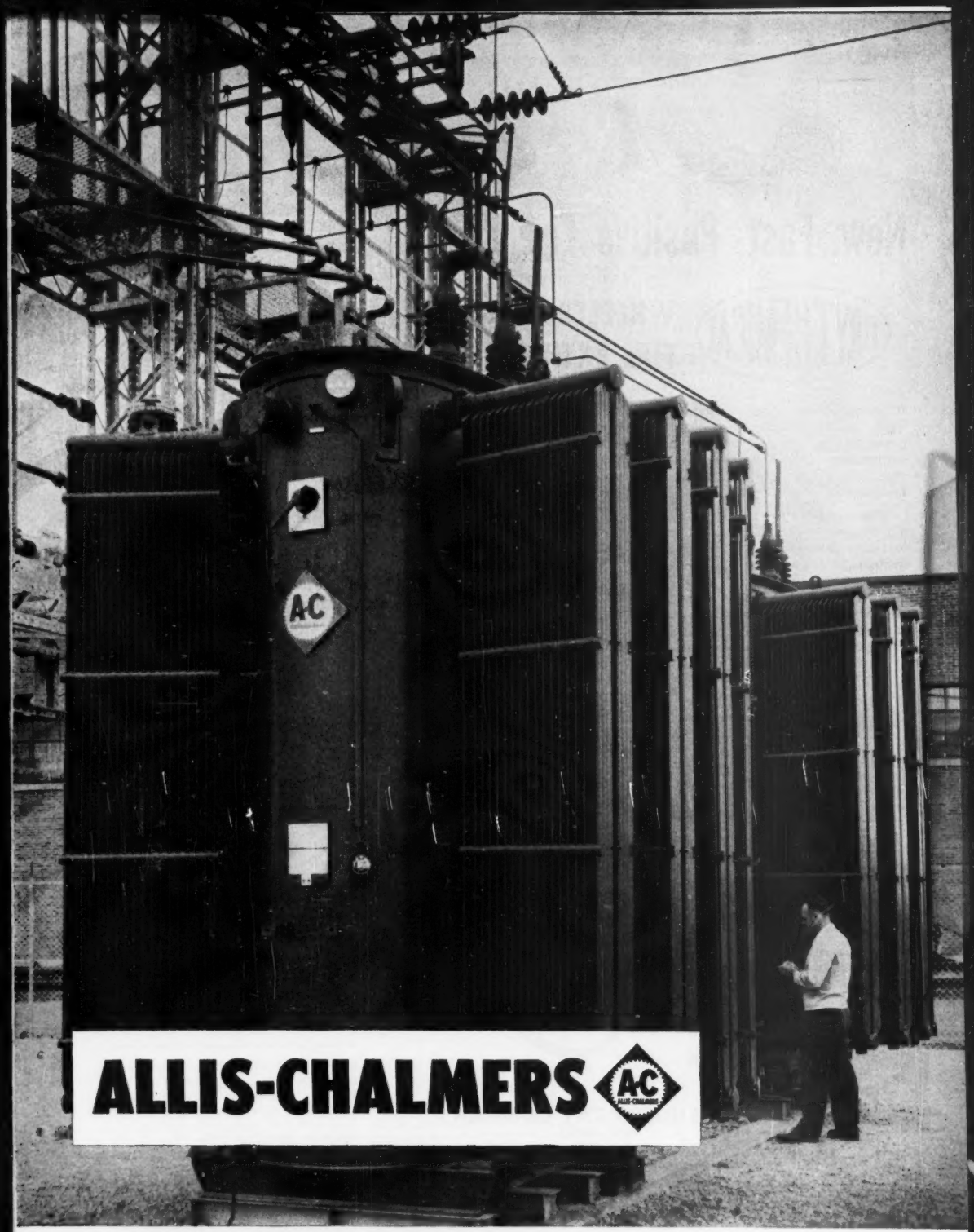
Because they're equipped with protective inert gas system (which preserves the high dielectric strength of the oil and minimizes filtering requirements) sludge and acid formation is retarded. They're electrically designed for proper stress protection . . . high and low voltage windings, coils and leads are strongly supported and securely braced against repeated short circuits. Specially designed radiator gaskets elimina,e leakage.

These are just some of the reasons why Allis-Chalmers transformers are doing a good job of power distribution for the nation's progressive electric power producers like Consumers Power Company. Whether standard or special designs, Allis-Chalmers can produce the specific transformer for your system.

Why not call in your A-C sales representative for more information on Allis-Chalmers power transformers? Offices in 64 principal cities. Allis-Chalmers, Milwaukee 1, Wis.

A-3387





Two 10,000 kva 3 phase, 60 cycle, 55° C rise, positive pressure inert gas equipped outdoor transformers installed by Consumers Power Company at Pontiac substation. Soon to be added is a 30,000 kva Allis-Chalmers power transformer at Erie.

New, Fast, Positive Fire Killer...

DRY CHEMICAL WHEELED PORTABLE FIRE EXTINGUISHER

Experienced engineering develops new, highly efficient 150-pound capacity dry chemical type wheeled portable fire extinguisher . . . has exclusive design that assures you of lasting, foolproof fire protection.

This new fire killer is easy to operate, compact, well-balanced and offers extensive maneuverability indoors or outdoors. Does a highly effective job on flammable liquid, gas and electrical fires, as well as surface fires involving ordinary combustible materials . . . granted unconditional B, C rating by the Underwriters' Laboratories, Inc.

Exclusive design renders constant free-flowing dry chemical . . . fire extinguisher is partially inverted for wheeling, then fully inverted at fire scene, which changes the position of the dry chemical in the tank and thereby provides mechanical breakage. This outstanding mechanical breakage feature, plus a continuous nitrogen pressured agitation or fluffing, together with a skillfully blended free-flowing dry chemical, guarantees a faster, more effective and complete discharge.

Rechargeable on-the-scene . . . no special tools needed . . . C-O-TWO Dry Chemical for recharging packaged in handy 50-pound size, moisture-proof containers . . . spare nitrogen pressure cylinders readily available.

Act now for complete free information on this newest contribution to modern fire fighting. Remember . . . you can't put fire off . . . fire doesn't wait. Get the facts today!

C-O-TWO FIRE EQUIPMENT COMPANY
NEWARK 1 • NEW JERSEY

Sales and Service in the Principal Cities of United States and Canada
Affiliated with Pyrene Manufacturing Company

MANUFACTURERS OF APPROVED FIRE PROTECTION EQUIPMENT

Squeez-Grip Carbon Dioxide Type Fire Extinguishers • Dry Chemical Type Fire Extinguishers
Built-In High Pressure and Low Pressure Carbon Dioxide Type Fire Extinguishing Systems
Built-In Smoke and Heat Fire Detecting Systems

"D.R." Plan

(*Continued from page* 148)

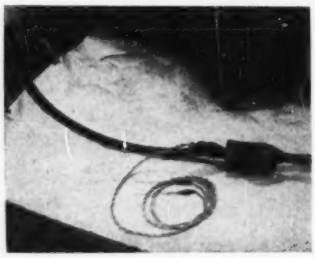
electric customer per "D.R." varies from 1,100 to 1,400 according to the district. As little outdoor metering is done by the company, every monthly reading means a contact between the "D.R." and the customer. The men's ages range between 20 and 60. Their compensation is about evenly divided between salary and commission. They are selected as a rule from the ranks of demonstrated good salesmen. In the last year the base salaries of the 43 men totaled $86,000 and commissions were about the same. Last February 46,000 lamps were sold in a special campaign through "D.R." efforts in the main. A daily return to the main office occurs about 4:30 p.m., with formal sessions monthly and informal gatherings at any time.

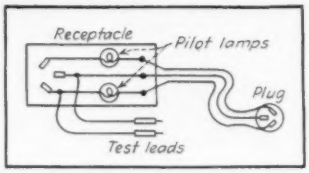
Efficient Test Set Locates Short Circuits in Ranges

CARL A. HASS

Division Appliance Service Supervisor
Indiana & Michigan Electric Co
South Bend, Indiana

A safe, simple, and effective test set for locating short-circuits on electric ranges is being used with con-





RANGE TEST SET quickly locates short circuits on range in customer's home. Set is connected as shown in upper illustration; schematic diagram below

siderable saving in time. The set was devised by this division and the material cost was less than $3.50. It is composed of a range cord, a range receptacle, and two 110-v pilot lamps

(*Continued on page* 156)

When power fails or any other emergency arises demanding manual valve operation LimiTorque Valve Controls prove their superiority again.

A positive, manual declutching lever disengages the motor driven worm gears and permits the handwheel to turn an independent set of bevel gears direct to the valve stem. This assures 3 to 4 times faster closing than is obtainable with other types of controls whose manual operations are all or in part through the main stem nut gearing. LimiTorque can always be declutched for handwheel operation regardless of weather or electrical conditions.

Remember—LimiTorques may be had for all types of valves and can be actuated by any available power source. Your valve manufacturer can supply them.

Write for the LimiTorque Catalog on your business letterhead, please.

Philadelphia Gear Works, INC.

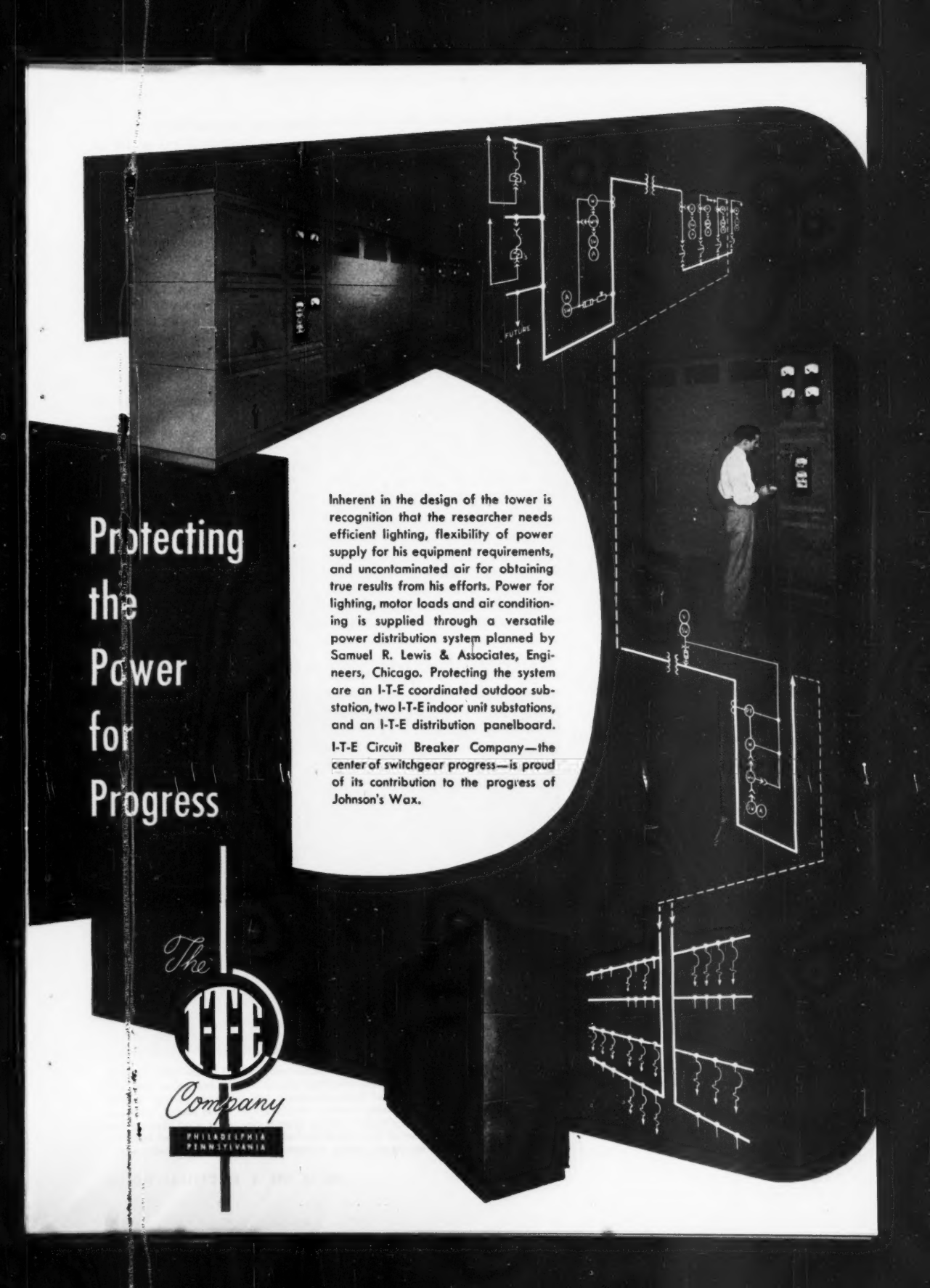
ERIE AVE. AND G ST., PHILADELPHIA 34, PA.
NEW YORK • PITTSBURGH • CHICAGO • HOUSTON
IN CANADA: WILLIAM AND J. G. GREEY LIMITED, TORONTO

Industrial Gears and Speed Reducers
LimiTorque Valve Controls

Lighting the Way for Progress

Blazing in the night over Racine, Wisconsin, is this dramatic, new 156-foot Research and Development Tower of S. C. Johnson & Son, Inc., world-famous manufacturer of wax products for home, industry and agriculture.

Embodying complete facilities for product research, development and quality study, the building stands as a tribute to the architectural genius of Frank Lloyd Wright and the progressive planning of Johnson's management.



Protecting the Power for Progress

Inherent in the design of the tower is recognition that the researcher needs efficient lighting, flexibility of power supply for his equipment requirements, and uncontaminated air for obtaining true results from his efforts. Power for lighting, motor loads and air conditioning is supplied through a versatile power distribution system planned by Samuel R. Lewis & Associates, Engineers, Chicago. Protecting the system are an I-T-E coordinated outdoor substation, two I-T-E indoor unit substations, and an I-T-E distribution panelboard.

I-T-E Circuit Breaker Company—the center of switchgear progress—is proud of its contribution to the progress of Johnson's Wax.

The I-T-E Company

PHILADELPHIA PENNSYLVANIA

it's all Polar Bear White

for better sight and better light

have you seen our doublespread on pages 30 and 31?

DON'T MISS IT!

Guth LIGHTING

THE EDWIN F. GUTH COMPANY • ST. LOUIS 3, MISSOURI

Leaders in Lighting since 1902

Test Set

(*Continued from page* 152)

with their receptacles.

On a range service call, we first refuse the range circuit to be sure all fuses are intact. Next the test set is inserted between the range and wall receptacle by plugging the test set into the wall receptacle and the range cord into the test receptacle. This connection places a pilot lamp in series with each "hot" side of the circuit.

If there is a range short-to-ground, one of the pilot lamps will glow at normal intensity. When the short is between two "hot" lines, both pilot lamps will glow. If the serviceman thinks there is a defective switch, he will disconnect the bus connection to the switches, one at a time. Then when the pilot lamp is de-energized, the defective part will have been located. When the wires feeding the switches, timer, or thermostat are moved, the pilot lamps will either go out or become dim, indicating a short on the part moved. Through such a process of elimination the short can be located and remedied.

A set of test leads is provided to be inserted as shown in the illustration.

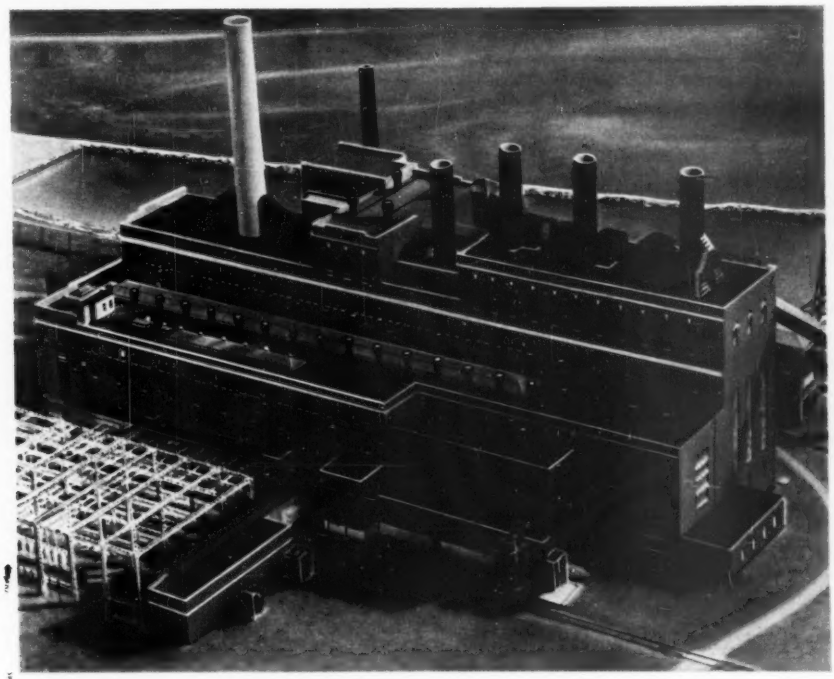
Sales and Service Notes

• For an increase of 1/3 of 1% in the cost of an $18,500 house, the owner can have nearly 3 times as many convenience outlets. The Orth Electric Co, Cincinnati, wired 2 new houses of the same size and installed a 60-amp service entrance and a 4-circuit distribution panel in each. In one house 22 duplex outlets were installed. The wiring cost $335. In the other house multi-unit strip was used for a total of 125 outlets. The cost was $403.43. Thus the owner of second house obtained 81 more outlets at an added cost of $68.43, about 85¢ each.

• Next to refrigerators, unit sales of radios in 11 months of 1950, and probably for the whole year, in the service area of the Pennsylvania Power & Light Co, are highest. Television is a close third. Fourth comes standard washing machines. Each of these four is an accepted item, needing little or no utility promotion. The order of 11-month sales of the four is respectively: 58,611; 39,692; 35,171 and 33,339. Proof of what can be done by promotion appears in the figure of range sales, 22,804 units, fifth from the top in a list of 15 appliances.

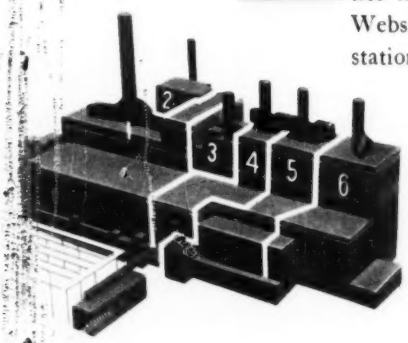
Display Boards Sell Adequate Wiring

ADEQUATE WIRING display panels like this—some 30 of them—are helping department stores, appliance dealers, electrical supply houses and other members of the Electrical Service League of British Columbia sell adequate wiring. Boards mount the components of a 100-amp service, complete with meter socket, entrance switch, gutter box, and branch circuit breakers to show customers what they get for their installation money. Cost of the boards was nominal, since they were built by contractor members of the league using equipment donated by manufacturers



THIRTY YEARS OF STEADY GROWTH

Since 1920, five additions have been made to the original South Meadow Station of the Hartford Electric Light Company. Many notable pioneering steps in the design of power facilities have been incorporated in this famous plant. Stone & Webster Engineering Corporation was retained for the entire station, including the latest 45,000 kw turbo-generator unit.



1 · **1920** — original station built on the South Meadows, Hartford, Conn.

2 · **1927** — the first commercial mercury turbine was installed at this plant — a bold advance in the development of power.

3 · **1930** — extension included one more steam unit bringing the capacity of the station to 90,000 kilowatts.

4 · **1937** — installation of a 45,000 kilowatt high pressure unit.

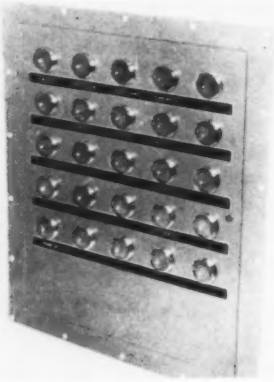
5 · **1942** — second 45,000 unit went into operation just in time to meet war needs of vital industries.

6 · **1949** — extension was built to house #6, the third 45,000 kilowatt high pressure unit to keep pace with area's expansion.

STONE & WEBSTER ENGINEERING CORPORATION

A SUBSIDIARY OF STONE & WEBSTER, INC.

NEW EQUIPMENT



Lamp Annunciators

Automatic service with the type ANN18 Annunciator provides audible as well as visual supervision of pressure, temperature, switches, liquids, vaults, etc. Relays are the plug-in type and are mounted directly to the rear of the 2-in. beehive lens lamp units. Lamp units are also available with 2-in. flat lenses for indication markings on the lens.

Operation is possible with voltages up to 250-v ac or dc.

H. R. Kirkland Co, Morristown, N. J.

•

Motor Control

The 301-A consists of a special motor and a control box operating from 115-v 60 cycle line. A meter calibrated in rpm gives motor speed.

Action of the control is to maintain the speed approximately constant under varying loads. Motor is reported to be capable of delivering 10-in. oz of torque at any speed between 50 and 5,000 rpm.

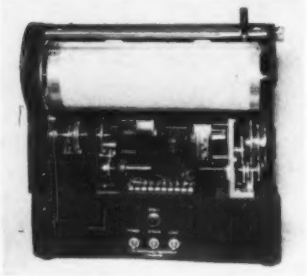
Industrial Control Co, Wyandanch, N. Y.

•

Recorder

Automatic plotting on rectangular coordinates of the simultaneous relationship between any two variables that can be made to actuate a set of movable core transformers (termed Microformers) is possible with the MD-2 recorder.

Sensing movements of 0.03 in. and 0.06 in. can produce full scale (10 in.) stylus displacement. Sensing move-



ments of 0.03, 0.06 and 0.120 in., can produce a drum rotation of 10 in. Each of the recording elements has a recording sensitivity of 0.000015 in. Movement of the external sensing unit can be recorded to an accuracy within 0.2% of the recorder scale range. Full scale response of the stylus across the chart can be obtained in 6 sec, full scale rotation in 20 sec.

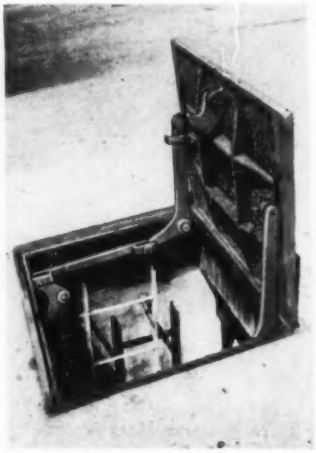
Baldwin - Lima - Hamilton Corp, Philadelphia 42, Pa.

•

Manhole Cover

Lifting this counterweighted cover to its vertical open position is a one-handed job. Opening is accomplished by inserting a combination key-handle and giving it a half turn.

This cover cannot slam or drop into vault. Counter-balance structure protrudes less than 6-in. from wall.



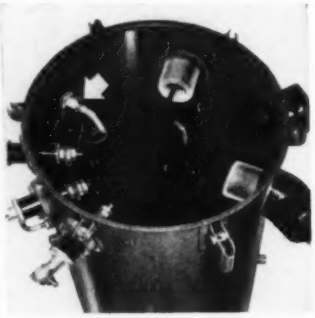
The cast iron frame and ribbed steel machined cover provide a 30-in. square opening.

E. A. Wachs Co, 1527 North Dayton St, Chicago 22, Ill.

•

Overload Indicator

Distribution transformers manufactured by Allis-Chalmers are now available with an overload indicator operated by a thermostatic element



in the top oil.

This element is designed to trip 80 C top oil temperature. When oil reaches the predetermined temperature, a signal light snaps on and stays on until turned off by the serviceman. Where records indicate repetitions of

FOR HIGHWAYS . . .

. . . OR BYWAYS

Cable jacketed with neoprene gives longer, more dependable service

IN MODERN highway lighting, cable is installed underground both for appearance and safety. The use of neoprene-jacketed cable for such installations is becoming more and more widespread as it proves itself on job after job. For neoprene is not subject to galvanic action which destroys metallic sheaths. Soil acids won't cause it to rot. And, where the line must be run above ground, this same neoprene jacket has resistance to sunlight and weathering that is unexcelled. On weatherproof wire, neoprene withstands long exposure to sunlight, heat and weathering . . . won't sag or cold flow on the wire. It is tough and resilient, stands up under scuffing and abrasion from tree limbs.

Today, there's long lasting neoprene-jacketed cable for practically any job. Your supplier will be glad to tell you more about this better kind of cable. It is made in single or multiple conductor types, in voltage ratings to fit your requirements. New and interesting applications of neoprene are fully described in each issue of The Neoprene Notebook. Write today for your free subscription. E. I. du Pont de Nemours & Co. (Inc.), Rubber Chemicals Division G-6, Wilmington 98, Delaware.

NEOPRENE

The rubber made by Du Pont since 1932

DUPONT

STRENGTHENING THE POWER SINEWS OF THE NATION WITH CAST ALUMINUM...

FOR ACSR AND ALL ALUMINUM CONDUCTOR

GREATER STRENGTH:	More than 25% safety factor.
GREATER POWER DELIVERED:	Hysteresis and eddy current power losses reduced to a minimum.
GREATER CONDUCTOR PROTECTION:	Insures against corrosion, heating and annealing damage to conductor within clamps.
GREATER SECURITY:	Backed by many years of coordinated electrical, mechanical and metallurgical engineering knowledge and experience in the design and manufacture of cast aluminum products.

OUR PRODUCTS ARE QUALITY CONTROLLED FROM INGOT TO FINISHED PRODUCT

Write today for **Catalog No. 320 on Aluminum Suspension and Strain Clamps**

Consult one of our nearest 18 representatives or contact our main office

ANDERSON BRASS WORKS, Inc.

POST OFFICE DRAWER 2151

BIRMINGHAM, 1, ALABAMA

• BRONZE AND ALUMINUM POWER CONNECTORS, FITTINGS, AND BUS SUPPORTS
ALUMINUM SUSPENSION AND STRAIN CLAMPS

Here's why JENKINS GOLD SEAL TAPE goes further

GUARANTEED FOOTAGE — you get full measure in every roll.

NO WASTE — Gold Seal Friction Tape tears evenly, does not ravel, conforms closely to uneven surfaces. Selected base cloth is made to high strength specification.

HIGH DIELECTRIC STRENGTH — Less footage is needed per job with Gold Seal Tape. No pinholes . . . one thickness insulates.

LASTING "TACK" — adhesive compound is prepared under laboratory control; this means that Gold Seal will stick to the job under severe conditions of cold and moisture.

EASY HANDLING — Cold Seal does not peel, dry out or smear the hands in hottest weather.

CELLOPHANE-WRAPPED — Keeps Gold Seal Tape factory-fresh until you're ready to use it.

PACKAGED FOR CONVENIENCE — in single rolls or handy 10-roll containers, it's the best buy in tapes. Jenkins Bros., (Rubber Division), 100 Park Ave., New York 17, New York.

JENKINS

Gold Seal Tape

FRICTION . . . RUBBER

MADE BY JENKINS BROS. . . . MAKERS OF FAMOUS JENKINS VALVES

overloads, this inexpensive load check singles out the units that should be replaced by larger rated transformers.
Allis Chalmers, Milwaukee, Wis.

•

Labeling Tape

Pressure sensitive, Labelon adheres to smooth surfaces without moistening.

This tape consists of a special writing surface sandwiched between two layers of acetate and can be written on with a pencil, stylus, or other blunt instrument. The identification, protected by the upper layer of acetate cannot be soiled, smudged, or scrubbed off.

Available in widths ranging from ⅝ to 1½-in. and in several colors.

Labelon Tape Co, 100 Anderson Ave, Rochester 7, N. Y.

•

Dumping Trailer

Built of heavy gauge steel with rolled edges to prevent injury, this unit is suitable for hauling and unloading wire, scrap, stampings, chemicals, etc.

A self-dumping hopper is held to prevent accidental dumping by a safety lock with safety catch. Balance of the hopper is such that when lock is released the hopper dumps its load

QUIET *as a*
Champion's Caddy!

HERE'S WHY:

1. Pinco "NOCORONA" Units have "fired-in" radio proofing . . . physically and ceramically an integral part of the insulator.
2. Have smooth conductor surfaces; are free from "fringe effect" and are resistant to arc-over burns.
3. Have rugged construction, unaffected by "NOCORONA" treatment.
4. Have service records dating back to 1929 *proving* quietness at operating voltage.
5. Have been manufactured since 1929 by approved Pinco processes.

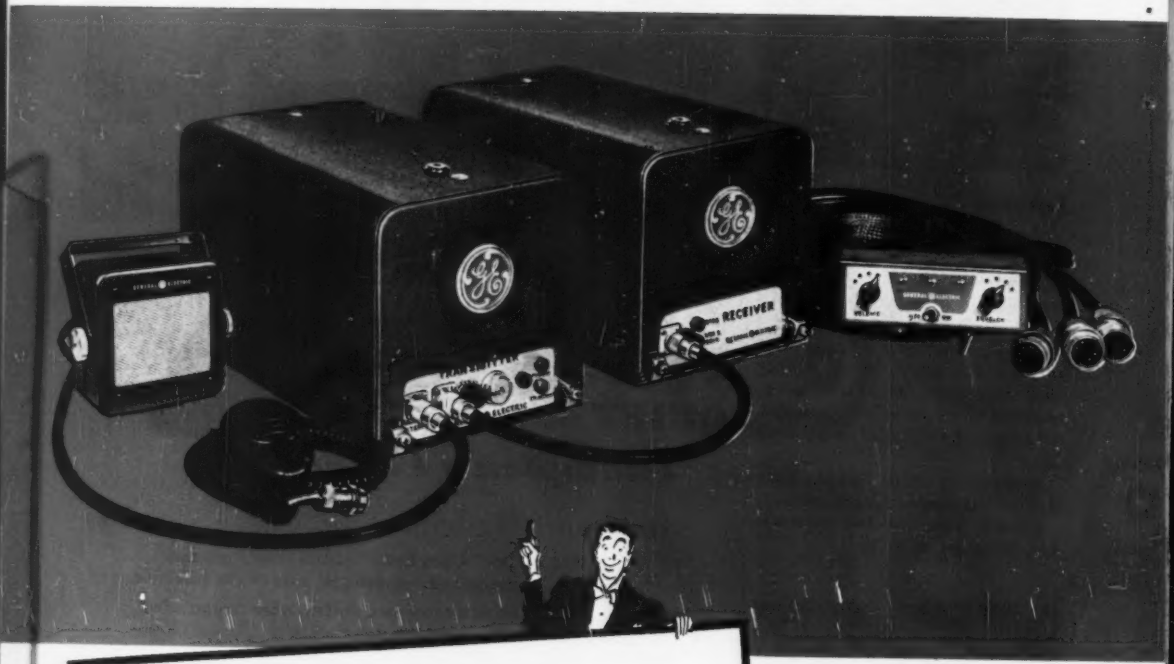
See Page 38, Pinco Catalog No. 49
for complete electrical and mechanical characteristics.

The Porcelain Insulator Corporation
761 Main St., Lima, N. Y.
Sales Agents: JOSLYN MFG. & SUPPLY CO.
Offices in Principal Cities

PINCO INSULATORS

Suspension Insulators . . . Switch and Bus Insulators . . . Distribution Clamps . . . Distribution Pin Types and Guy Strains . . . Transmission Line Fittings . . . Tree Insulators . . . Transformer and Circuit Breaker Bushings . . . One Piece and Multi-part High Voltage Pin Types . . . Suspension and Strain Clamps . . . Indoor Bus Support Porcelain . . . Lightning Arrester Porcelain

In 2-way radio G.E. MAKES MORE THAN ANY OTHER



Laboratory and field tests show G-E unsurpassed in direct comparison with the best of competition

Adjacent Channel Selectivity—This G-E equipment lets you drive "closer to the other fellow's tower" without interference.

Intermodulation Interference Rejection—In "crowded air" this feature becomes increasingly important. The G-E unit shown above was 14db better than competition on adjacent channel tests.

Desensitization—In the presence of strong adjacent channel signals, the General Electric receiver desensitizes almost 15db less than other makes.

Sensitivity—With battery voltages as low as 4.5v, the G-E receiver *still* delivers a signal—long after others have "blacked out."

Receiver Oscillator Radiation—Lowest of any yet tested—only 20 micro-microwatts!

WHAT A PERFORMANCE PACKAGE—HERE'S WHAT YOU GET!

Selectivity in a class by itself—new 4-coil IF transformers . . . minimum intermodulation and high image ratio . . . sensitivity that stays up even when the battery's down . . . lower tube replacement cost and lower standby battery drain than other makes. It's the best 2-way radio performance your dollar can buy!

OF ITS COMPONENTS MANUFACTURER!

THIS is important to users of 2-way radio because it means you get a complete General Electric product from the chassis up . . . tubes, transformers, dynamotors, crystals, capacitors—all designed, engineered, and manufactured by G.E. to insure rigid quality control and a superior product.

But quality alone is not enough. More General Electric 2-way radio equipment was bought last year than in any similar period in the company's history. To meet this growing demand a new plant has been established at Utica, New York, devoted exclusively to the manufacture of our complete radio communication line.

When you buy a 2-way radio system, consider the years of service you expect to get out of it. Examine all makes—then put your money into lasting quality, backed by a name you can believe in—General Electric.

TUBES—Receiver types and transmitter types—made at G-E plants at Owensboro, Kentucky, and Schenectady, New York.

TRANSFORMERS & CHOKES—Two mighty important reasons why G-E station transmitters are rated for continuous duty cycle. Made by G.E. at Fort Wayne, Indiana.

SPEAKERS—With the famous aluminum voice coil for all-weather performance. Made at Electronics Park, Syracuse, New York.

DYNAMOTORS—Another G-E product from Fort Wayne. They're built for 100,000 starts!

PYRANOL CAPACITORS—The last word in component dependability. A G-E specialty from Pittsfield, Mass.

BEFORE YOU BUY ANY RADIO COMMUNICATION EQUIPMENT . . . PROVE THIS TO YOURSELF

When you have checked the feature chart at left, call the radio communication man at the G-E office near you. He will tell you more about the equipment and arrange a demonstration. Meanwhile, mail this coupon today for complete information kit.

General Electric Co., Sec. 1961-18
Electronics Park—Syracuse, N. Y.

Yes, send me your FREE INFORMATION KIT on General Electric 2-way radio equipment.

NAME.....

ADDRESS.....

CITY.....STATE.....

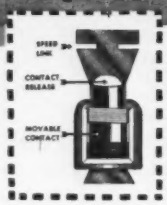
You can put your confidence in

GENERAL ELECTRIC

how to keep hot circuits cool

Trion

DUAL ELEMENT TRIPLE PROTECTION FUSE WITH THERM-A-TRIP



HOW IT WORKS

A short circuit blows speed link instantly. Therm-A-Trip (matched to thermal capacity of the motor or transformer it protects) also opens circuit when safe surrounding or load temperatures are exceeded. Provides adequate protection with extra long time delay.

Trion — THE THREE-IN-ONE FUSE

TRION is the coolest operating fuse of any type.
TRION gives instantaneous cut-off on short circuit.
TRION controls rate of rise of recovery voltage.
TRION has longest safe time-lag of any overload protective device,
TRION's time-delay averages five times longer than any renewable or one-time fuse.
TRION starts heavily loaded motors safely.
TRION protects against single phasing.
TRION's watt (power) loss is substantially lower.
TRION's tripping temperature provides a heat ceiling 500° F. lower than any zinc link fuse.
TRION reduces and controls the heating of switches and fuse clips.
TRION permits the use of switches of lower rating.
TRION keeps hot circuits cool.

A TRION FOR EVERY CIRCUIT

Trions are available in 141 Standard Sizes ranging from 1 to 600 amps for both 250 and 600 Volt circuits. Other sizes for these same voltages range from 1/10 amp to 9 amps. Midget Sizes (3/4" dia. by 1 1/2" long) vary from 1/10 amp to 10 amps. ASK FOR TRION OR WRITE FOR FREE TRION BULLETIN #506-A TODAY.

"Look to Shawmut for leadership"

THE CHASE-SHAWMUT CO.
370 MERRIMAC STREET • NEWBURYPORT, MASSACHUSETTS

Spiderlag Trion C-O-T Trionet C-O-T FUSE WIRE

and then returns to loading position. Lock then automatically engages, holding the hopper in place.

Phillips Mine & Mill Supply Co, 2344 Jane St, Pittsburgh 3, Pa.

•

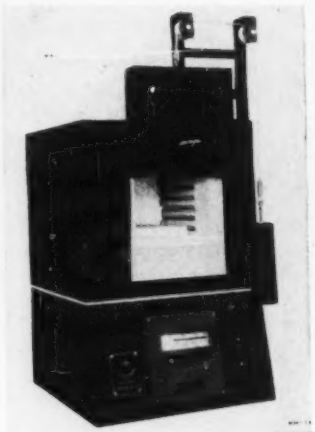
Rolling Scaffolds

Available in several heights to satisfy a variety of needs, a new line of aluminum scaffolds reportedly eliminates needless weight without sacrificing structural strength.

Standard frames, braces, platforms, and rubber tired casters can be assembled to fit almost any need. Components lie flat for transportation and storage.

Patent Scaffolding Co, Long Island City 1, N. Y.

•



Electric Furnace

Automatic control of temperatures ranging from 300 F to 2200 F is possible with the 869 combination hardening and tempering furnace.

Wired for 220 v single-phase operation it is 8 in. wide by 6 in. high by 9 in. deep and has a maximum consumption of 4 kw.

K. H. Huppert Co, Chicago, Ill.

•

Arc Welders

Indoor and all-weather models of 300, 400, and 500-amp arc welders are provided with Hot-Start control including arc-stabilizing capacitors. Current ranges are 60-375 for the 300-amp model, 80-400 for the 400-amp, and 100-675 for the 500-amp model.

The silicone insulation operates at

(*Continued on page* 168)

REASONS WHY POWER MEN PREFER
VICTOR SUSPENSION INSULATORS

V CONTROLLED FORMING *plus* smooth, hard glaze give unsurpassed self-cleaning characteristics. Maintenance costs are reduced, especially in contaminated areas.

V ALL METAL PARTS are hot-dipped galvanized to assure maximum resistance to weathering and corrosion.

V SPECIAL "CUSHION" COATINGS at all joining surfaces eliminate problems caused by thermal variations and mechanical shock.

V CONTROLLED TESTING and PROCESSING of cement provide high bond strength at all assembly joints.

V HEAVY OUTER EDGE of porcelain provides added resistance to chipping.

V RUGGED, THICK CORRUGATIONS and smooth, rounded edges give maximum resistance to mechanical impact.

VICTOR NO. 900 SUSPENSION INSULATOR
For complete engineering data on this and other sizes and types of suspension units, write today for Bulletin No. 4.

Features like these are just an indication of the vast amount of research and engineering which go into the design and manufacture of VICTOR Suspension Insulators. No wonder power men prefer VICTOR Suspension Units.

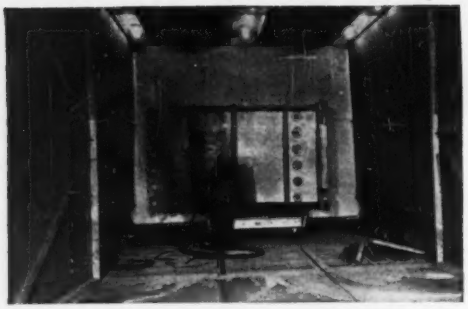
Do You Know that...

Every porcelain insulator produced at VICTOR is subjected to the most rigid controls throughout its entire manufacture . . . from laboratory tests on every lot of raw materials to routine high frequency and 60 cycle flashover with modern testing equipment? Result—VICTOR insulators more than meet industry standards.

Specify
VICTOR
SUSPENSION INSULATORS

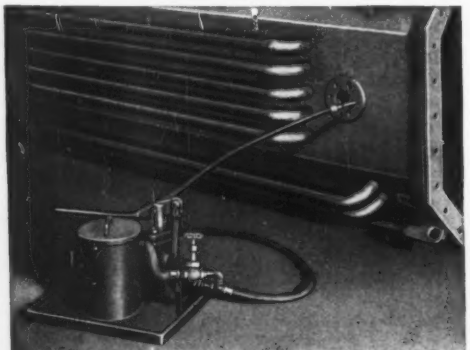
VICTOR INSULATORS, INC. VICTOR, N. Y.

Bases are formed from exceptionally heavy plate. Heavy structural steel channels and angles are welded to the steel base. Tanks can be provided with flanged or flat wheels—any desired gauge.



After the welding operations are completed, each transformer tank is "sandblasted" with steel grit which removes all plate scale and weld scale to provide a clean, solid base to which the paint will adhere.

All power transformer tanks are flow painted with three coats of paint—a primer coat, a bonding coat, and a heavy finishing coat. Each coat is thoroughly baked on the tank to assure a weather-resisting surface.



All tank covers, bushing mounting-flanges, radiator connections, and all welded joints are pressure-tested for possible leaks. Mounting bosses are tested with a very thin fluid at a pressure of 250 pounds per square inch.

Wagner

POWER TRANSFORMERS

built to give extra value— in longer service life

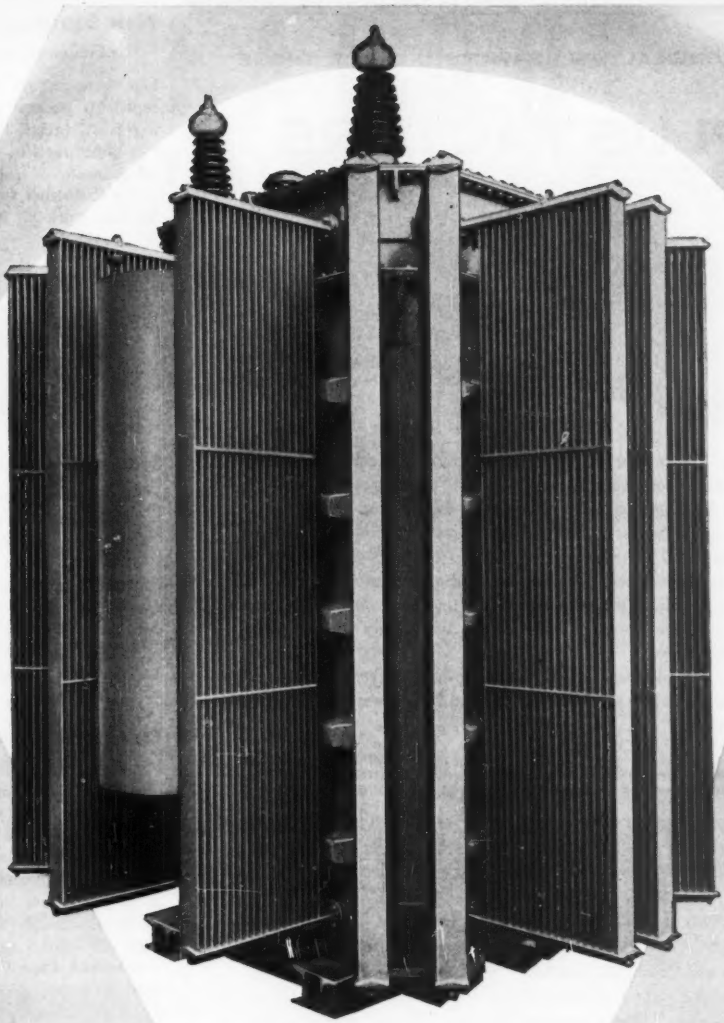
Wagner has the knowledge and facilities to make the building of power transformers part of the day's work—knowledge and facilities gained in sixty years of transformer manufacturing.

Engineering experience, the use of only the highest quality materials, carefully controlled production methods, and rigid inspections and tests all combine to give Wagner Power Transformers the ability to give extra value—in longer service life.

The unusual care exercised in tank construction is typical of the way in which additional years of service are built into Wagner Transformers. All parts used in fabricating these transformers are formed of heavy steel-plate. The formed parts are electrically welded into an integral unit, then are sandblasted and painted.

® Wagner Electric Corporation

1891 1951



Wagner Power Transformers have a reputation for quality — well-known to our utility and industrial customers.

Liberal design, coupled with painstaking care in manufacture, give them the stamina to maintain a continuous flow of power, even under the frequent overloads demanded by today's requirements on system capacity.

Users of power transformers will find it to their advantage to consult Wagner engineers on their next transformer installation. Thirty-one branch offices, located in principal cities, are at your service. Bulletins TU-180 and TU-181 give information on the complete line of Wagner Transformers.

WAGNER ELECTRIC CORPORATION

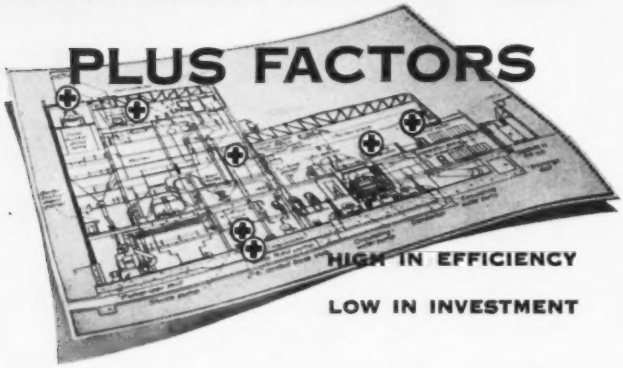
6456 PLYMOUTH AVENUE, ST. LOUIS 14, MO., U. S. A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS — AIR AND HYDRAULIC

BRANCHES IN 31 PRINCIPAL CITIES

T51-12

COMMONWEALTH'S SERVICES INCLUDE THOSE



A recent independent survey of Steam-Electric Construction Cost and Annual Production Expenses of 200 plants shows that those designed by Commonwealth Associates, engineering subsidiary of Commonwealth Services, held a very favorable position for efficiency and economy.

Among those selected as representing the "highest in efficiency of operation" while at the same time being in the group representing "lowest plant investment," eight among the leaders were of Commonwealth design.

In an over-all comparison, Commonwealth engineered plants were 10% lower than average in investment and 23% lower in production expenses.

Let us show you how Commonwealth design may increase your plant efficiency while holding investment to a minimum. Write for our booklet describing the services of Commonwealth Associates. Address: Commonwealth Services Inc., Department AG, 20 Pine Street, New York 5, N.Y.

- **Financial** *(including Registration and Prospectus details)*
- **Accounting** *(Statistical, Financial, Methods and Systems)*
- **Stock Transfer and Proxy Solicitation**
- **Taxes**
- **Valuations and Appraisals**
- **Depreciation Studies**
- **Merchandising and Advertising**
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- **Public and Stockholder Relations**
- **Industrial Relations**
- **Insurance** *(Pension and Welfare Plans)*
- **Metering**
- **Engineering . . . Design and Consulting** *(Electrical, Civil, Mechanical, Architectural, Chemical, Gas)*
- **Electric and Gas System Planning, Industrial Planning, Investigations, Analyses and Reports**
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COMMONWEALTH SERVICES · INC. AND COMMONWEALTH ASSOCIATES · INC. ENGINEERING SUBSIDIARY

20 PINE STREET NEW YORK 5, N. Y. HANOVER 2-0170
7 HAYES STREET JACKSON, MICH. DIAL 8121
1025 CONNECTICUT AVE. N.W. WASHINGTON 6, D.C. STERLING 3343

ABILITY · EXPERIENCE · RESOURCEFULNESS · RESULTS

New Equipment

(*Continued from page* 164)

high temperatures and is also water repellent. Because there are no rotating parts, except for the fan on the two larger models, maintenance costs are reduced.

Air Reduction Co, Inc, 60 E. 52nd St, New York 17, N. Y.

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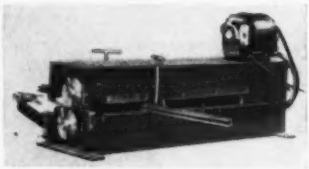


Slitting Machine

Small shops with no room for a large shear should find either Model 2024 or 1624 slitting machine useful.

Mild steel up to 16 or 20 gauge, depending upon the model selected, can be slit. A 27-in. throat permits cuts to the center of four foot sheets.

Wilder Manufacturing Co, Carmel Valley Route, Monterey, Calif.

•

Electrical Tape

Intended primarily for use in the electrical and automotive industries Parmacel 29 Vinyl Electrician's Tape is reported to have an insulation resistance of 88,000 megohms at 91% relative humidity and 67,000 megohms at 96% relative humidity. It has 200% elongation. Backing is black vinyl film of 5.5 to 6 mil thickness.

Industrial Tape Corp, New Brunswick, N. J.

•

Combustion Safeguard

Immediate fuel cut-off in case of failure is provided by an electronic combustion safeguard system intended for commercial oil burners. The coordinated equipment includes a switch-amplifier-contactor unit, phototube holder, and electode holder.

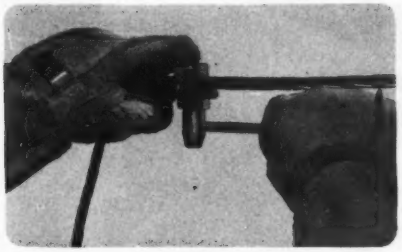
The system is reported to assure positive protection against combustion failure because: (1) If the gas pilot does not ignite, the oil valve cannot open, and (2) if the oil flame does not ignite, the supply of fuel is cut off.

The motor circuit is controlled directly by the built-in contactor for

(*Continued on page* 172)

FARGO

. . . A "UTILITY" for UTILITIES



An avowed policy of *specialization*—initiated away back in 1914—has firmly established the name FARGO as synonymous with service to the greatest public service industry in the world.

FARGO Wire and Cable Accessories are recognized by leaders and experts in the Utility field for excellence of engineering design . . . for quality of materials used . . . and for preference among linemen.

Today's critical need for increased power supply is already emphasizing the importance of FARGO products. To keep pace with the stepped-up emergency demands, everything possible is being done to supply old customers and, as quickly as it can be done, meet the needs of new ones.

Those who have had experience with FARGO in the past, as well as the new friends we hope to make, will need no reassurance that the FARGO standard of quality will be rigidly maintained, no matter what conditions may prevail.

FARGO AUTOMATIC LINE SPLICES

Fargo's exclusive one-piece jaw construction makes for the greater strength and permanence inherent in all Fargo Automatic Line Splices. They are easily, quickly and safely installed without tools. And, on both new construction and maintenance, their overall cost is low.

FARGO

Manufactured by

FARGO MFG. COMPANY, INC.

Poughkeepsie, N.Y.

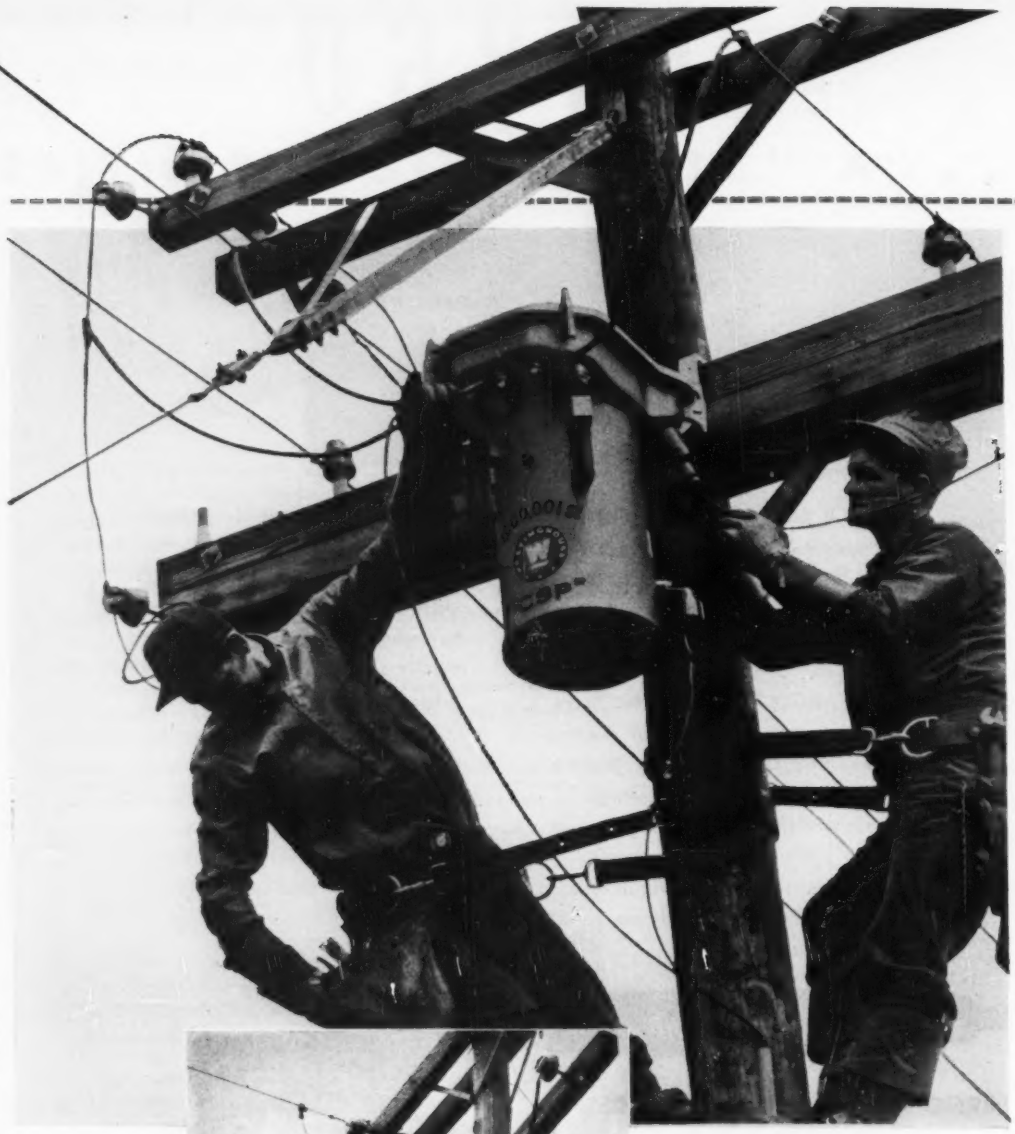
Distributed by

LINE MATERIAL COMPANY

(A McGraw Electric Company Division)

Milwaukee, Wisconsin

LM®



Above: Linemen tie in the newest Westinghouse "CSP" Transformer to go on the Ohio Edison system. It's the 1,000,001st "CSP" Distribution Transformer to come off the Westinghouse production line.

Inset: The first Westinghouse "CSP" Transformer, installed by Ohio Edison in November, 1933. On Route 8 North of Akron, Ohio, it's still giving dependable service today.

YOU CAN BE **SURE**.. IF IT'S

Westinghouse

SEVENTEEN YEARS

Proof enough for one customer

Back in 1933, Westinghouse delivered the first of a new type of distribution transformer to Ohio Edison . . . the "CSP" (Completely Self-Protecting) Transformer. Today, seventeen years later, it's still in service. For a "CSP" Transformer, this record is not unusual.

Ohio Edison has standardized on the completely self-protecting type of transformer and in line with this policy, Westinghouse "CSP" number 1,000,001 has been installed on the Ohio Edison System.

Such performance establishes beyond doubt that "CSP" Transformers offer long-range dependability plus savings in operating costs. It's easy for you to prove for yourself that "CSP" Transformers, with both thermal and lightning protection built in, can cut distribution costs for you . . . are economical to install . . . inexpensive to maintain. Ask your Westinghouse representative for a copy of B-4247B, "TRANSFORMER COSTS . . . and their relation to PROFITS". Or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-70567

Penta Preserved Poles cost no more than other treated poles

You'll get lots of praise from linemen, installers and trouble-shooters when you start using Penta-protected poles. That's because Penta Preservative treatment is clean—easy on the men who climb the poles.

You can absolutely depend on Penta for protection from insect attack and decay. Even after years of service, you'll find no ground line decay, shell rot, top rot, or insect damage in Penta-treated poles and cross-arms.

That's because PENTAchlorophenol is a powerful, stable and uniform wood preservative—allows measured and positive protection. It's always the same! Penetrates deeply and will not leach out. Doesn't affect conductivity, creates no special problems.

Specify PENTA treatment for safeguarding your poles, cross-arms and other wood construction. It costs no more than other commonly used types of preservatives. Write us for complete facts and names of companies supplying Penta-treated forest products.

CHAPMAN CHEMICAL COMPANY
333 N. Michigan Ave. • *Chicago 1, Illinois*
Dermon Building • Memphis 3, Tennessee

CHAPMAN™

Penta Preservative

Conforming to A. W. P. A. Specifications P8-49 and P9-49

New Equipment

(*Continued from page* 168)

motor ratings up to and including ½ hp, 110/120 v, single-phase. For larger motors and for multi-phase operation, a complete line of magnetic switches is available for use with the master control unit.

General Electric Co, Apparatus Dept, Schenectady 5, N. Y.

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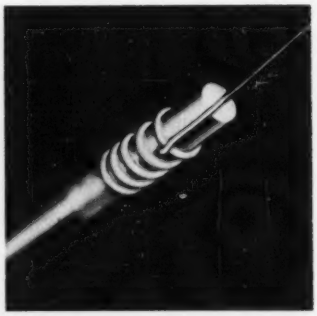

Ground Rod

To assure proper contact, five turns of 12 gauge, soft drawn copper wire are bonded to upper end of this pigtail ground rod.

The solder-dipped copper conductor is formed in a tie at the upper end to prevent it from stripping off the rod. Ground connection is made to the 18-in pigtail section of the conductor. Drive point is high carbon steel, heavily galvanized to resist corrosion.

A. B. Chance Co, Centralia, Mo.

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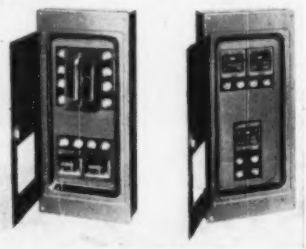


Service Entrance Equipment

Two new types of 100 ampere fusible service entrance equipment are now available.

Series type (left photo) utilizes a 100 ampere fusible pullout disconnect which controls all branch circuits. These devices are available with two

NO ROOM FOR GLARE—Corrugated white translucent PLEXIGLAS panels form a 600-square-foot, wall-to-wall luminous ceiling in this laboratory of the Excel Pharmacal Company, in New York City. Throughout the room, the evenly diffused illumination provides pleasant, efficient lighting. Note the low source brightness and minimum brightness contrast between ceiling, floor, walls and working surfaces. The lapped acrylic plastic panels are suspended on T-bars 14" below fluorescent tubes running parallel to the corrugations.

PLEXIGLAS Luminous Ceiling Passes Tough "Lab-Lighting" Test

Lighting gets a real test in Excel Pharmacal Company's laboratory—where critical visual tasks demand the best possible illumination. The PLEXIGLAS luminous ceiling passes that test easily—diffuses light completely—virtually eliminates glare and shadows—creates a luminous environment, easy on the eyes and nerves.

PLEXIGLAS acrylic plastic also simplifies the design, installation and maintenance of lighting systems. Because it is so easily cut, shaped and fabricated, PLEXIGLAS is being widely used in coffer and cove lighting, as overhead diffusing panels, and for completely enclosed fixtures. Strength and light weight make it easy and economical to ship and erect. And resistance to discoloration and breakage cuts maintenance costs to a minimum.

In more and more laboratories, drafting rooms, schools, offices—wherever close visual work makes *efficient* lighting essential—you'll find PLEXIGLAS. For full details of this durable, light-diffusing acrylic plastic, simply write us on your business letterhead.

CHEMICALS FOR INDUSTRY

• A steadily increasing percentage of PLEXIGLAS production, now at record levels, is required for the defense mobilization program. The supply available for civilian applications is limited.

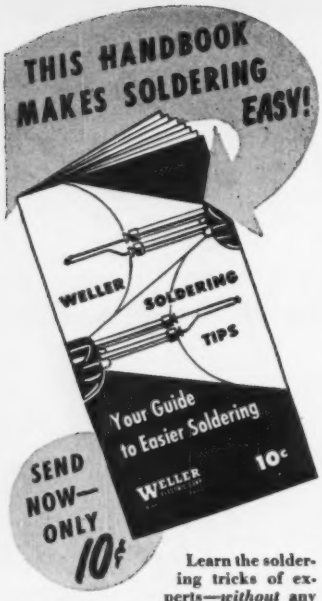
PLEXIGLAS *is a trade-mark, Reg. U. S. Pat. Off. and in principal foreign countries.*

Canadian Distributor: *Crystal Glass & Plastics, Ltd., 54 Duke Street, Toronto, Ontario, Canada*

ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

Representatives in principal foreign countries



Learn the soldering tricks of experts—*without* any hard study. This revised and up-to-date, 20-page handbook leads you step-by-step to real soldering skill. Time-saving methods, DO's and DON'T's, difficult operations, fluxes and solders, all made clear by 43 easy-to-understand illustrations. NOT a catalog, but a real professional's pocket manual. Send only 10 cents in coin.

GET NEW WELLER SOLDERING GUN CATALOG, TOO

When you send for your copy of SOLDERING TIPS, be sure to ask about the new Weller Soldering Guns. Fastest, handiest soldering tools you've ever seen—just point, pull, and solder!

WELLER
ELECTRIC CORP.
817 Packer Street, Easton, Pa.

W

Weller Electric Corp., Easton, Pa.

☐ Enclosed find 10 cents in coin, for which please send me my up-to-date copy of revised Weller "Soldering Tips."

☐ I am also interested in the new Weller Soldering Guns. Please send Free Catalog Bulletin.

Name_____

Address_____

City_____ State_____

220 volt, 30 or 60 ampere branch circuits and either 8, 10 or 12 plug fuse, 110 volt circuits.

Parallel mains type (right photo) connects the three 220 volt, 30 or 60 ampere pullout circuits in parallel, thus eliminating the need for a main disconnect. One of the pullouts controls 4, 6, or 8 plug fuse, 110 volt circuits. The other pullouts control the range, water heater, or other 220 volt circuits.

Square D Co, 6060 Rivard St, Detroit 11, Mich.

•

Synchronous Motor Timer

Designed for a wide variety of timed operations, Type SY timer can be used for intervals ranging from 0.5 sec to 24 hr.

There are two separate solenoids: One operating the clutch and timer mechanism, the other actuating five spdt load contacts independent of the timing mechanism. The timer automatically resets for each new cycle. Pre-set interval and elapsed time are both indicated. This instrument is available for either 115 or 230 v ac.

General Control Co, 1200 Soldiers Field Rd, Boston 34, N. Y.

•

Control Panel

Designed for use with squirrel-cage motors driving commercial washing machines the 723 control panel provides a reversal and a dwell period between reversals to prevent tangling clothes.

Four reversals per minute are provided. A dwell period between reversing periods is adjustable from ¼ to 10-sec. Panels are supplied for 2-wire control, operated from a maintained contact push button, or 3-wire control used with a momentary contact push button.

Allen-Bradley Co, Milwaukee 4, Wis.

MORE NEW PRODUCTS
about which you should know

Appleton Electric Co, 1701-59 Wellington Ave., Chicago 13, Ill., offers a **two-piece connector** for ½, ¾, or 1-in. thinwall conduit. No locknut is needed, connector tightens with a single wrench. . . . The Daven Co, 191 Central Ave, Newark 4, N. J., has added Type OP-962 to its line of **output power meters** for measuring power delivered by an audio signal system to a given load; range is 0.1 mw to 100 w.

Garden City Planting & Mfg Co, 1750 N. Ashland Ave, Chicago 22, Ill., has announced the 5500 Series of **recessed troffers** for one to four rows of fluorescent or slimline lamps in 4, 6, and 8-ft sizes . . . Cornell-Dubilier Electric Corp, South Plainfield, N. J., offers MC and NF series **vehicular capacitors** (by-pass and feed-through, respectively) for suppression of radio frequency interference; details in Bulletin NB-140.

American Chronoscope Corp, 316 W. First St, Mount Vernon, N. Y., has added to its line of electronic time measuring equipment Model 110 **high-speed chronoscope** and Model 211 input adapter. Eight ranges measure from 0-300 milliseconds, and 0-3 seconds; units operate from 110-v.

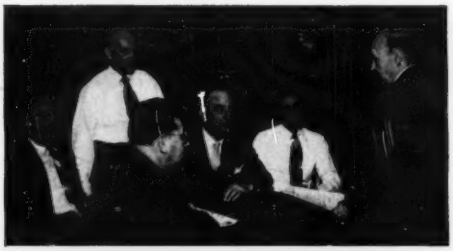
Yardney Electric Corp, 105 Chambers St, New York 7, N. Y., has added Model No. 5 HR to its line of Silvercel **storage batteries.** It will discharge at 5 amp for one hour, and is capable of being discharged at rates up to 20 amp . . . Weston Electrical Instrument Corp, 614 Frelinghuysen Ave, Newark 5, N. J., has produced a **thermometer testing set** of nine matched thermometers for the range from −36 to +760 F. . . . Westinghouse Electric Corp, 306 Fourth Ave, Pittsburgh 30, Pa., has introduced an **elevator landing system** which is said to increase passenger handling capacity of a car up to 10% because of time savings.

Look for methods that help beat shortages — Graybar has tailored its services specifically to meet the particular requirements of the power and light industry.

You'll find that – if you order ahead – you can still expect the same efficient, co-operative service you have *always* received from Graybar.

Modern inventory methods plus our nation-wide network of over 100 offices and warehouses provides a system that helps reduce the possibility of local shortages . . . helps you get materials *when* and *where* you need them.

Look behind the Graybar tag



Look for specialized planning aid — Through years of specialized service, Graybar has developed an intimate understanding of the problems of utilities like yours.

That's why you can count on your local Graybar office to provide prompt, up-to-the-minute product information on both everyday and emergency needs.

In addition, your Graybar Representative and – at nineteen strategic locations – a Graybar Outside Construction Specialist are always on call to work with you in solving unusual problems.

Look for materials that are right for the job — From near-by Graybar you can fill all of your electrical requirements via a single transaction—and be sure you're getting dependable items.

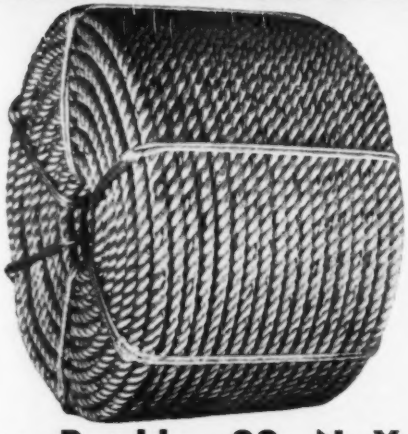
You save the time and expense of multiple orders . . . you always get the products of leading manufacturers. 167-96

GRAYBAR
ELECTRIC COMPANY, INC.
Executive offices:
Graybar Bldg., New York 17, N. Y.

Everything for your Pole Lines via GraybaR

GRAYBAR DISTRIBUTES MORE THAN 100,000 ELECTRICAL PRODUCTS.
See the following pages for more information about items manufactured by typical Graybar suppliers.

Two top grade ropes built for the tough, rough jobs of the utility business—"American Brand" and "Amco" Treated All-weather Pure Manila Ropes. They're manufactured to exacting standards for uniformity and dependability and are lubricated with exclusive cordage solutions to preserve the natural strength and flexibility of the choice Manila fibre. Both ropes are made in all sizes and constructions.



"AMERICAN BRAND"
and "AMCO" Treated All-weather
PURE MANILA ROPES

American Manufacturing Company, Brooklyn 22, N. Y.

ROPE • TWINE • OAKUM • PACKING • CARPET AND ELECTRICAL YARNS

Branch Factory: St. Louis Cordage Mills, St. Louis 4, Mo.

SALES OFFICES: BOSTON • CHICAGO • HOUSTON • NEW ORLEANS • PHILADELPHIA • SAN FRANCISCO

Look behind the Graybar tag

4 REASONS WHY RAINIER CROSSARMS belong in YOUR pole-line program

1 **SELECTION** — Extra value in crossarms, as in many other quality products is the end result of *planned manufacture*. With American Crossarm and Conduit Company, careful selection of timber for manufacture of Rainier crossarms is the first important step.

2 **KILN DRYING** — Rainier kiln drying is superior because of scientific control during the seasoning period — correct temperature and the right humidity all the time while in the kiln means all fungus growth killed—timber seasoned throughout.

3 **SEASONING**—Rainier air seasoned crossarms are also carefully seasoned by control of air circulation and by the location of the seasoning sheds, as well as proper piling of the timber during the drying period.

4 **STOCKS** — The American Crossarm and Conduit Company, manufacturers of Rainier crossarms, through Graybar offer the careful buyer of crossarms an additional service — stocks at strategic locations. For planned-ahead buying or for emergencies, this fact is your assurance of lower shipping costs — quicker service.

Remember! A crossarm produced from improperly or carelessly processed timber might cost less at the time of purchase, but it certainly *is not cheaper per year of life service.*

For further information on crossarms that may pay you dividends in lowered maintenance and replacement costs, write or phone your nearby Graybar Line Construction Specialist. Graybar is located in over 100 principal cities.

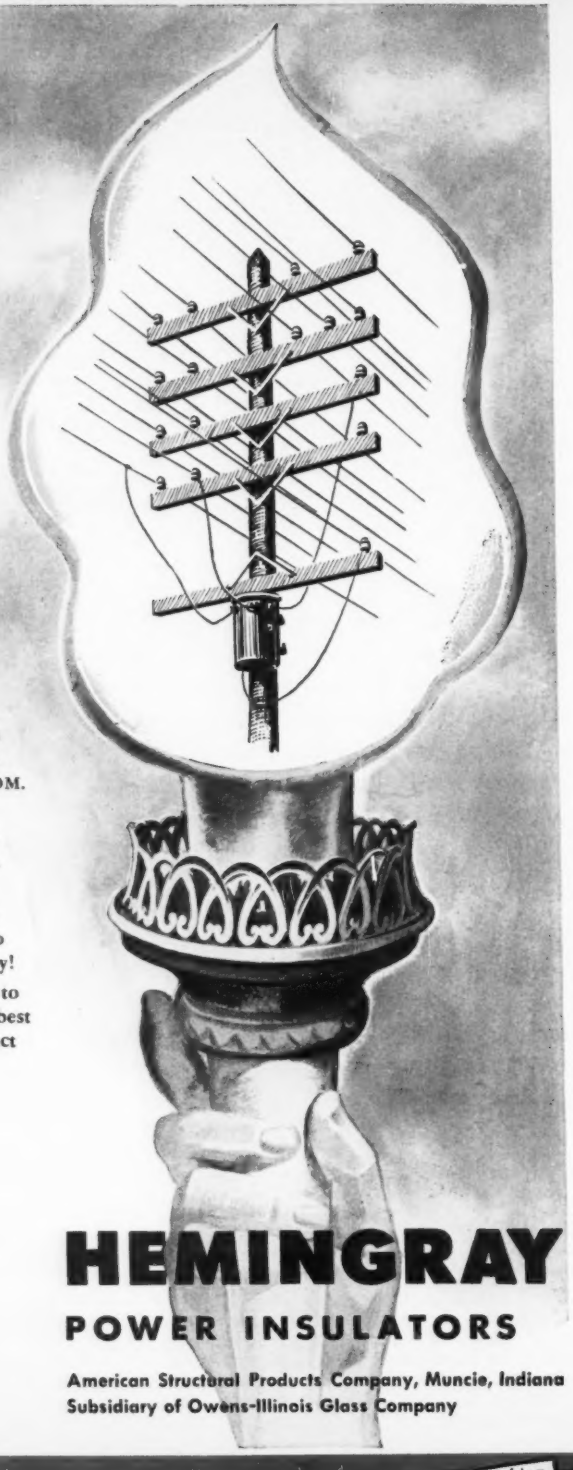
AMERICAN CROSSARM AND CONDUIT COMPANY

RAINIER WOOD PRODUCTS TRADE MARK

Look behind the Graybar tag

GRAYBAR Everything Electrical GraybaR ELECTRIC COMPANY

Where does America's POWER come from?



Not the kind of power Hemingray Insulators so ably protect on the power lines. We speak of the strongest force in America . . . FREEDOM. Where does *that* power come from?

You know. Freedom comes from what you do . . . and what we do . . . and what every American does.

So in these troubled and serious times, we reaffirm our belief in and determination to do business the American way—the freedom way!

And for us, that way is to pledge with you to keep America powerful and free—to do the best job we know how—to supply the best product we can make—to price fairly, service dependably and deal honestly with all.

HEMINGRAY
POWER INSULATORS

American Structural Products Company, Muncie, Indiana
Subsidiary of Owens-Illinois Glass Company

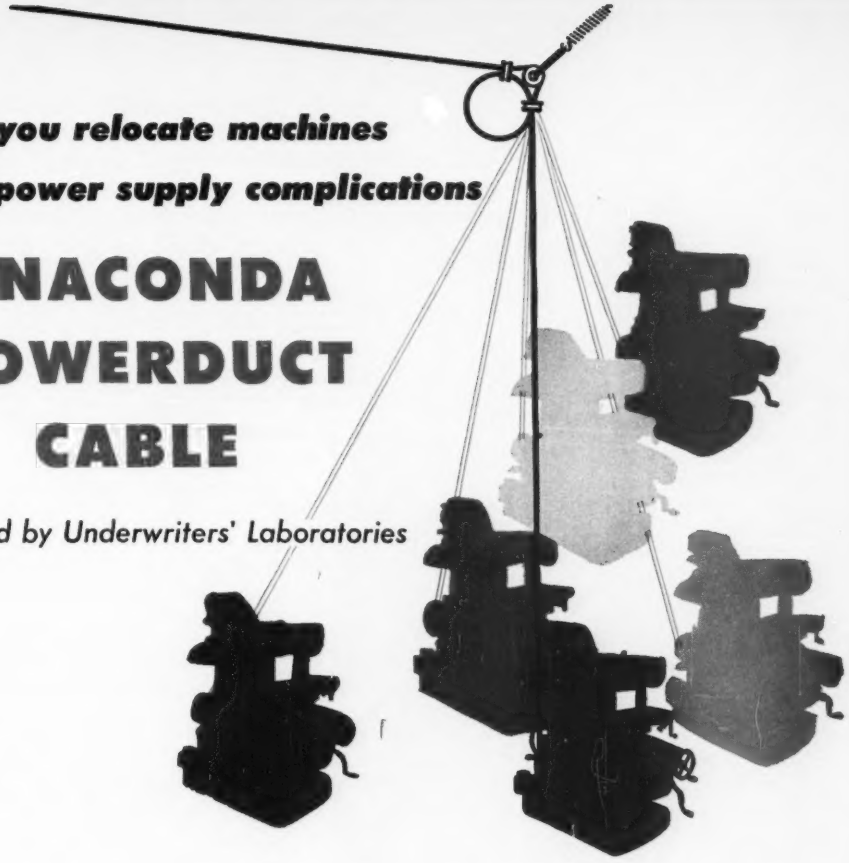
Look behind the Graybar tag

When you relocate machines

avoid power supply complications

with **ANACONDA POWERDUCT CABLE**

Approved by Underwriters' Laboratories



If you use a bus duct system for power distribution, make the most of it by using ANACONDA Powerduct Cable. Provides maximum flexibility and dependability. It's the *only* cable of its type fully approved by the Underwriters' Laboratories for use without conduit. Get complete information from your nearest Anaconda Sales Office or Anaconda Distributor. Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.

5135

5 BIG ADVANTAGES

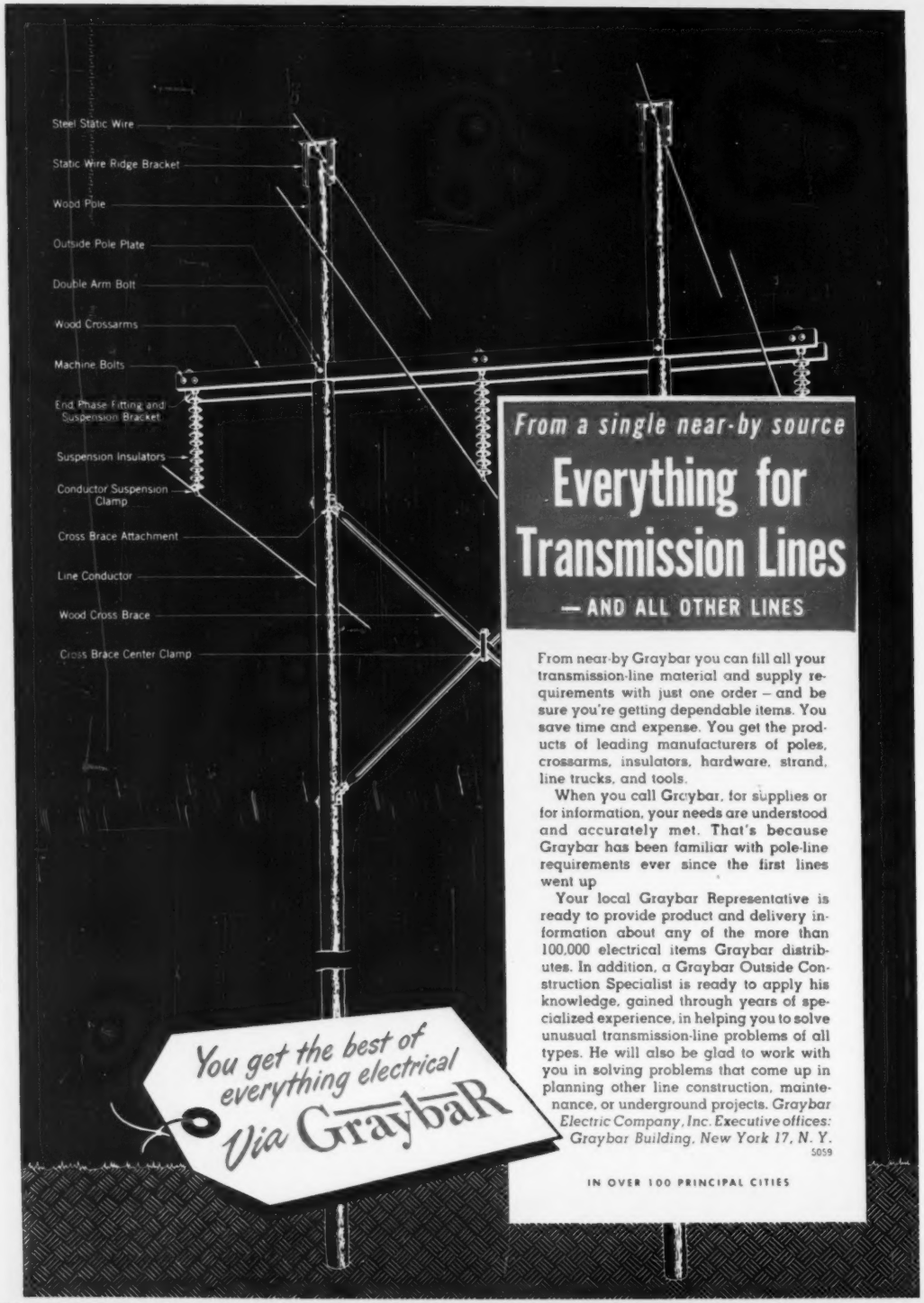
1. **Meets fully all Underwriters' Laboratories requirements.**
2. **Cable is firmly gripped—can't slip.**
3. **Gives maximum freedom, flexibility and availability to bus duct system.**
4. **Withstands mechanical abuse—impervious to oils, water, grease, cutting compounds.**
5. **Easy to handle. Neat appearance.**

*Reg. U. S. Pat. Off.

the right cable for the job

ANACONDA® WIRE AND CABLE

Look behind the Graybar tag



From a single near-by source

Everything for Transmission Lines

— AND ALL OTHER LINES

From near-by Graybar you can fill all your transmission-line material and supply requirements with just one order – and be sure you're getting dependable items. You save time and expense. You get the products of leading manufacturers of poles, crossarms, insulators, hardware, strand, line trucks, and tools.

When you call Graybar, for supplies or for information, your needs are understood and accurately met. That's because Graybar has been familiar with pole-line requirements ever since the first lines went up

Your local Graybar Representative is ready to provide product and delivery information about any of the more than 100,000 electrical items Graybar distributes. In addition, a Graybar Outside Construction Specialist is ready to apply his knowledge, gained through years of specialized experience, in helping you to solve unusual transmission-line problems of all types. He will also be glad to work with you in solving problems that come up in planning other line construction, maintenance, or underground projects. *Graybar Electric Company, Inc. Executive offices: Graybar Building, New York 17, N. Y.*

5059

IN OVER 100 PRINCIPAL CITIES

You get the best of everything electrical

Via GraybaR

Look behind the Graybar tag

Everything Electrical GraybaR

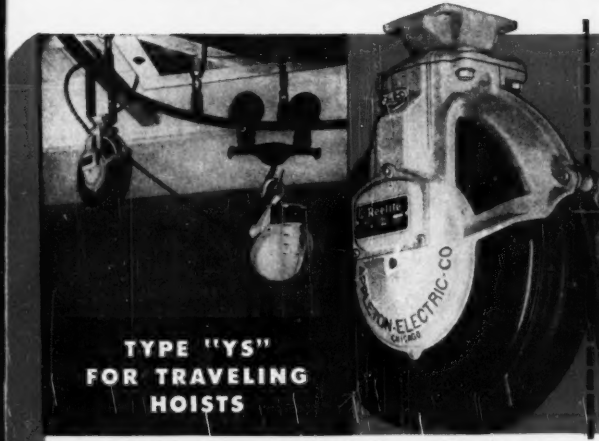
Positive Safety

FOR PLANT AND PERSONNEL

APPLETON REELITE

TRADE MARK

Automatically Takes Up, Pays Out Conductor Cable
Keeps Cord Reeled Up Safely Out of the Way



The Appleton Type "YS" Reelite for traveling hoists is built with a swivel base, permitting cord to be fed in any direction. Mounted at the mid-point, a Type "YS" Reelite equipped with 45 feet of cord will serve a stretch of track 90 feet long, straight or curved.

The Type "YS" Reelite eliminates the necessity for exposed current collectors, trolleys or wires. Outer cover easily removed to service brushes and power spring, or to make solderless line connections direct to terminal block. Oil-less bearings at all points of rotation.

RATING: 15 Amperes, 550 Volts A.C.; 250 Volts D.C.

Sold Through Electrical Wholesalers

APPLETON ELECTRIC COMPANY

1705 Wellington Avenue • Chicago 13, Illinois

14 Branch Offices and 7 Resident Representatives in all Principal Markets

SEND TODAY for free copy of new Bulletin 504. Fifty full pages describing Appleton Reelites shown here, plus special types and combinations for power tools, air and liquid lines. Or see Sweet's File. Page 2a/Ap.

APPLETON ELECTRIC PRODUCTS

NOW... A GREAT NEW APPLETON REELITE

Here's the new, *all new*, Appleton 7S Portable Reelite—an automatic cord reel that takes light right where it's needed, in car-loading, stock-keeping, machine inspection, building maintenance—on hundreds of jobs that require bright, safe, movable illumination. Now equipped to swivel continuously in either direction. Keeps cord reeled up out of the way. Positive stop action holds cord at desired length—re-reels cord when job is done. Available accessories include six types of hand lamps, machine tool connector body or key socket.

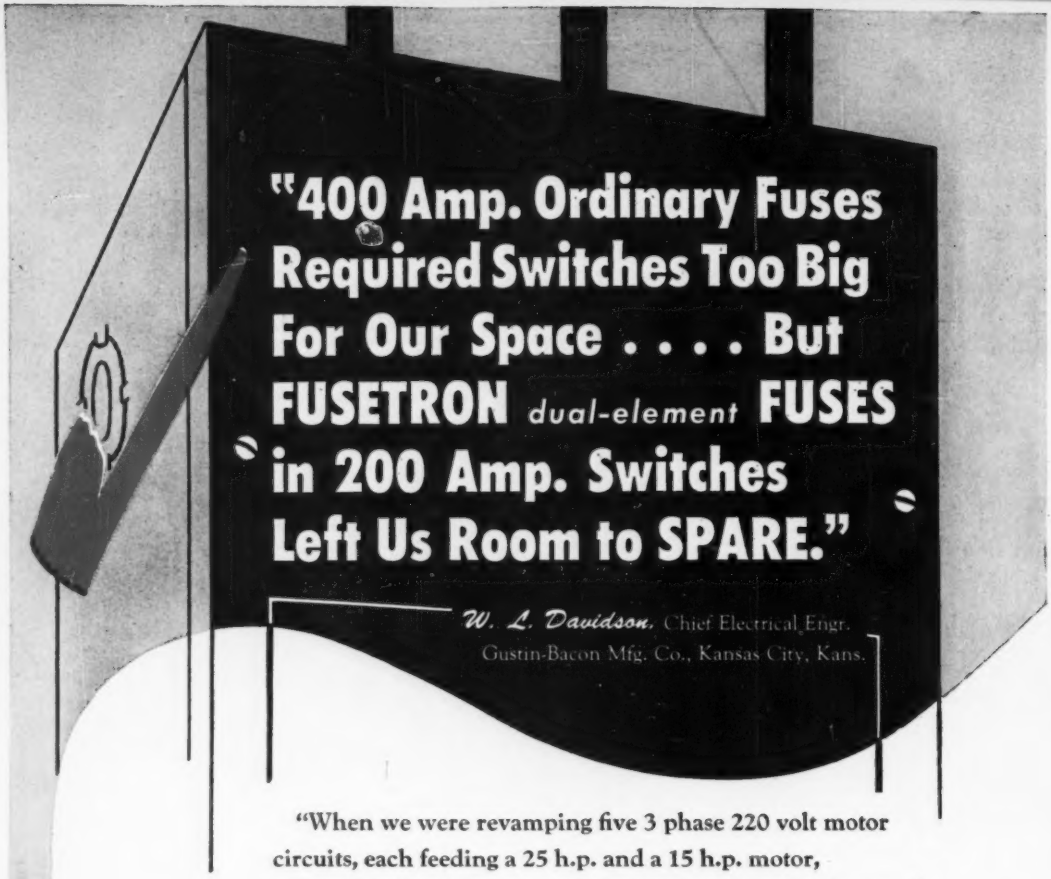
CONSTANT DUTY TYPE FOR HEAVY JOBS

Carries smooth, uninterrupted power to moving electrical machines. Automatically winds up and pays out rubber covered cable to cranes, hoists, elevators, lifting magnets, generator sets—heavy mobile equipment of every kind. Pays for itself in efficiency, safety, cable protection.

APPLETON

CONDUIT FITTINGS • LIGHTING EQUIPMENT • OUTLET AND SWITCH BOXES • EXPLOSION-PROOF FITTINGS • REELITES

Look behind the Graybar tag



"400 Amp. Ordinary Fuses Required Switches Too Big For Our Space . . . . But FUSETRON *dual-element* FUSES in 200 Amp. Switches Left Us Room to SPARE."

W. L. Davidson, Chief Electrical Engr.
Gustin-Bacon Mfg. Co., Kansas City, Kans.

"When we were revamping five 3 phase 220 volt motor circuits, each feeding a 25 h.p. and a 15 h.p. motor, at our Fairfax plant — we found we were short of room for the 400 amp. main switches required by ordinary fuses.

"By changing to Fusetron dual-element fuses, however, we were able to use 200 amp. switches and have room to spare.

"The installation has proved very satisfactory, and in addition, we get better protection because the motors are fused nearer to the operating load."

FUSETRON
TRUSTWORTHY NAMES IN ELECTRICAL PROTECTION
BUSS

(FUSETRON is a trade mark of the Bussmann Mfg. Co., Division of McGraw Electric Co.)

Look behind the Graybar tag

Graybar Everything Electrical Graybar

You Get 10 Point Protection by changing to

Fusetron DUAL-ELEMENT Fuses

1. * Protect against short-circuits.
2. Protect against needless blows caused by harmless overloads.
3. Protect against needless blows caused by excessive heating — lesser resistance results in much cooler operation.
4. Provide thermal protection — for panels and switches against damage from heating due to poor contact.
5. Protect motors against burnout from overloading.
6. Protect motors against burnout due to single phasing.
7. Give DOUBLE burnout protection to large motors — without extra cost.
8. Make protection of small motors simple and inexpensive.
9. Protect against waste of space and money — permit use of proper size switches and panels.
10. Protect coils, transformers and solenoids against burnout.

*Fusetron Fuses have high interrupting capacity as shown by tests of the Electrical Testing Laboratories of New York City in December 1947.

Here's Why You Get This All-Purpose Protection

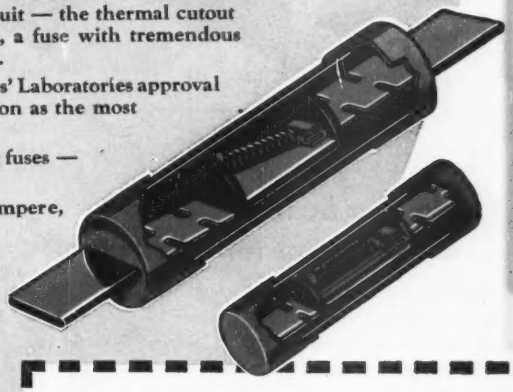
The fuse link element opens on short-circuit — the thermal cutout element protects on overloads — the result, a fuse with tremendous time-lag and much less electrical resistance.

They have the same degree of Underwriters' Laboratories approval for both motor-running and circuit protection as the most expensive devices made.

Made to the same dimensions as ordinary fuses — fit all standard fuse holders.

Obtainable in all sizes from 1/10 to 600 ampere, both 250 and 600 volt types. Also in plug types for 125 volt circuits.

Their cost is surprisingly low.



Don't Risk Losses!

One **needless** shutdown . . .
One **lost** motor . . .
One **destroyed** switch or panel . . .
One **burned out** solenoid . . .

May cost you far more than replacing every ordinary fuse with a Fusetron dual-element Fuse.

Mail the Coupon Now!

Bussmann Mfg. Co., University at Jefferson
St. Louis 7, Mo. (Division McGraw Electric Co.)

Please send me complete facts about FUSETRON dual-element Fuses.

Name.....

Title.....

Company.....

Address.....

City and Zone..... State..... 651

Look behind the Graybar tag

Everything Electrical — GraybaR ELECTRIC COMPANY

You know it's RIGHT when you specify CHANCE

Chance Anchors

meet every guying need

Whatever your guying requirement may be, there's a Chance Anchor that will do the job most efficiently. The Anchors shown here are made in a wide variety of sizes. Each type is designed for certain soil and guying conditions. One of these Anchors will do your specific job better than any other anchor you can choose.

Many Graybar houses carry stocks on this complete line of anchors. The Graybar man in your area can give you complete information to help you select and order the Chance Anchors best suited to your requirements.

CHANCE 8 WAY EXPANDING ANCHOR

SWAMP SCREW | POLE KEY | NEVER-CREEP | ROCK | STEEL CONE | STEEL SCREW

Chance Line Construction Tools...

help you build better lines... save labor

Anchoring efficiency depends a lot on how your anchors are installed. Hole sizes need to be exact for greatest holding power. The adjustable auger helps you bore them right. Proper expanding requires the right kind of expanding bar. Chance Line Construction Tools help crews do better anchoring and simplify pole setting operations. Consult your Chance or Graybar Catalog.

A·B·CHANCE CO·
210 NORTH ALLEN ST.
CENTRALIA MISSOURI

C51-3

Look behind the Graybar tag

Graybar Everything Electrical Graybar

Now available in *your* territory . . .

Corrosite, the protective plastic paint, is now being distributed by Graybar. If you haven't investigated this material—and seen what it can do in protecting against corrosion, rust, erosion and rot—we suggest you get in touch with the Graybar sales office near you.

Corrosite is composed of vinyl resins, blended with plasticizers, to form a paint that is impervious to alkalies, alcohols, acids and salt water. It physically and chemically bonds to almost any type of surface—can be used to protect metals against chemical destruction; to seal and waterproof concrete, cinder block or masonry; to protect wood against rot. It produces a hard, durable, lustrous finish—non-inflammable when dry—that will not oxidize, and will resist checking, cracking and crazing for years.

Complete information, and samples, can be secured from your Graybar sales office. *The Corrosite Corporation, Chrysler Building, New York 17, N. Y.*

Corrosite

Protective Plastic Paint

Look behind the Graybar tag

GraybaR Everything Electrical GraybaR ELECTRIC COMPANY

COFFING HOISTS

built for LONGER USE

backed by BETTER SERVICE

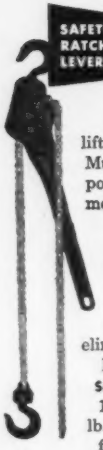
Here is a line of hoists built to stay on the job, reduce time-consuming breakdowns, protect men and equipment with a wide margin of safety.

Prompt, efficient Coffing service, immediate shipment of replacement parts gives further assurance of complete satisfaction for years to come.

Choose the size and type to fill your requirements and find out for yourself that there is a difference in hoisting equipment.

QUIK-LIFT ELECTRIC HOISTS

Ruggedly built for the most continuous assembly line use. For long life, all moving parts are sealed, running in oil. For safety, parts are tested at 100% overload. **Seventeen models** — 500 to 4,000 lb. capacities.



SAFETY-PULL RATCHET LEVER HOISTS

A safe, sure lift for any load. Multiplies man power, protects men and equipment. Dual ratchet and pawl cannot slip or drop load. Safety valve handle eliminates overload dangers. **Seven models** — 1,500 to 30,000 lb. capacities... factory tested at 100% overload.

HOIST-ALL

A handy all around tool for hoisting, lifting, pulling. Without its stand, it is an efficient hoist, puller, or load binder. With stand, it becomes a powerful high-lift jack. **Two sizes** — 2,000 and 4,000 lb. capacities.

SAFETY LOAD BINDERS

Powerful, highly portable, safe. Dual ratchet and pawl hold securely. Handle cannot fly up when released for another "bite." **Two models** — 3,000 and 6,000 lb. capacities.

SPUR-GEARED CHAIN HOISTS

With extra heavy malleable iron castings, drop forged steel hooks, and special wear-resistant alloy steel in moving parts, these hoists stand up for years under the most demanding service ...factory tested at 100% overload. Automatic brake holds load securely at any position. **Seven models** — ½ to 5-ton capacities.

MIGHTY-MIDGET PULLERS

Big pulling power in a small package. Light, compact, a Mighty-Midget hangs easily on a tool belt. Handle can be used either as a lever or a high-speed crank. Two sizes. 500-lb. model weighs only 6½ lb. 1000-lb. model weighs only 9½ lb.

DIFFERENTIAL CHAIN HOISTS

Widely used in warehouses, garages, and by contractors where speed is not essential. **Four models** — ¼ to 1½ ton capacities.

I-BEAM TROLLEYS

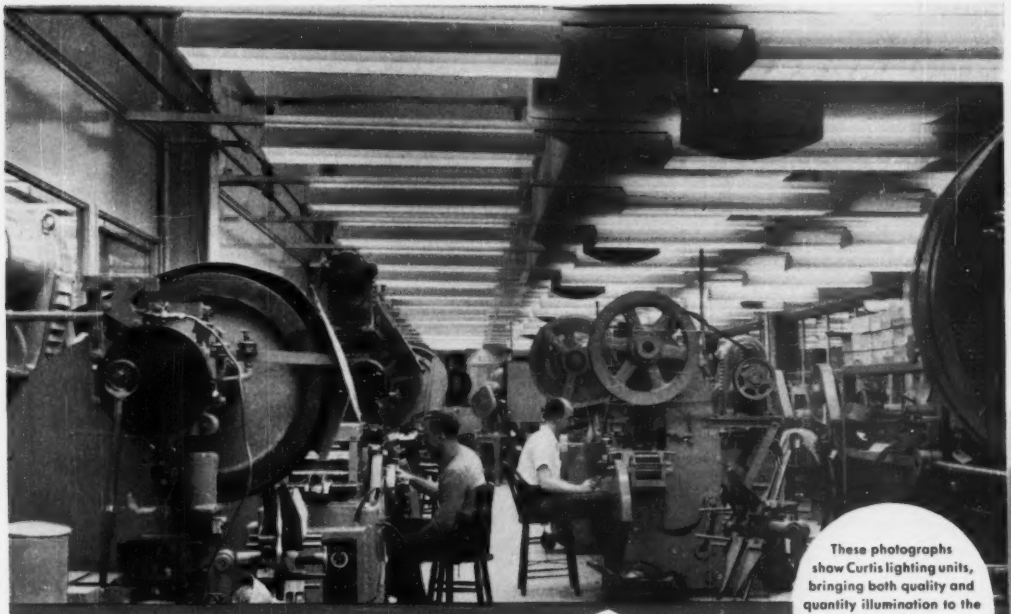
Built for years of satisfactory service. **Plain or geared types.** Capacities up to 10-tons.

COFFING HOIST COMPANY

Danville, Illinois

Look behind the Graybar tag

CURTIS industrial lighting is engineered for . . . . . .



These photographs show Curtis lighting units, bringing both quality and quantity illumination to the Metals Controls Corporation plant in Attleboro, Mass.

PEAK PRODUCTION

WRITE for the complete, illustrated story of how Curtis Engineered Industrial Lighting brought an entirely new concept to an industrial lighting problem

CURTIS LIGHTING, INC.
DEPT. F 18-14, 6135 W. 65TH ST., CHICAGO 38, ILLINOIS

Name_____

Address_____

City_____ State_____

Look behind the Graybar tag

OTISTYLE Everything Electrical GraybaR ELECTRIC COMPANY

Workers Can See What They're Doing In This Plant

Production men know that good factory lighting steps up production, cuts down spoilage, improves employee morale. But, to correct inadequate lighting, many plants merely increase the footcandles of light intensity—and think they've solved the problem. Actually, *too much* light . . . or glare from bare fixtures . . . can be as harmful as insufficient light. To get best results from plant and worker, light must be adequate *and* comfortable.

Day-Brite designs industrial lighting fixtures which give *both* adequate and comfortable light. In the Day-Brite lighted plant shown above, you can see clearly and without strain . . . without glare or shadows . . . in every part of the plant.

And — Day-Brite makes *only* quality fixtures which give years of trouble-free service . . . the lowest possible installation and maintenance costs. Proof? The hundreds of large American factories which use Day-Brite fixtures . . . and get complete satisfaction.

If *you* have factory lighting problems ask Day-Brite for help without obligation. Write to Day-Brite Lighting, Inc., 5417 Bulwer Ave., St. Louis, Mo.

**The upward component provided through the reflector apertures minimizes contrast between the fixture and the surrounding ceiling area, adding to the overall comfort of the complete installation.*

NOW, MORE THAN EVER

AMERICA MUST SEE WHAT IT'S DOING

IT'S EASY TO SEE WHEN IT'S

"DECIDEDLY BETTER"
DAY-BRITE
Lighting Fixtures

141

Look behind the Graybar tag . . .

"GraybaR" Everything Electrical "GraybaR" Electric Company

UTILITY LIFTING JOBS MADE *QUICK AND EASY* WITH DUFF-NORTON JACKS

Duff-Norton Jacks save unlimited time, effort and money for light, power, street railway, railroad, telephone and telegraph companies, in maintenance of pipe lines, track, poles, bridges, heavy equipment, etc. There's a Duff-Norton Jack for every utility application. Write for data and proposal on these dependable jacks for your requirements.

CABLE REEL *Jacks*

Duff-Norton Cable Reel Jacks are standard with utility companies for lifting and holding heavy cable reels, because they meet the most exacting demands of utility crews under most adverse field conditions. Weather-proof, non-rocking, they provide rapid, even lifting and lowering.

Specifications				
Jack No.	Capacity Tons	Height Inches	Raise Inches	Weight Pounds
1030-CR	10	30	14	110

Other reel jacks are available with multiple hooks, for handling reels of varying diameters and weights.

POLE PULLING *Jacks*

Duff-Norton Pole Pulling Jacks pull or straighten utility poles without laborious digging. Hinged channel base permits jack operation at an angle or in upright position as required. "Service" need not be interrupted when these jacks are used.

Specifications					
Jack No.	Capacity Tons	Height Inches	Raise Inches	Base Inches	Weight Pounds
529	5	28	18	7x16	91
500	15	37½	23	10x24	250

These Duff-Norton Jacks

SAVE UTILITIES TIME • ENERGY • MONEY

- **TRENCH BRACES**
- **HYDRAULIC JACKS**
- **AUTOMATIC LOWERING JACKS**
- **PUSH AND PULL JACKS**
- **SCREW JACKS**
- **AIR MOTOR POWER JACKS**
- **MANY OTHERS THAT MEET EVERY UTILITY NEED**

• WRITE FOR CATALOG 203

THE DUFF-NORTON MANUFACTURING CO.

MAIN PLANT and GENERAL OFFICES, PITTSBURGH 30, PA.—CANADIAN PLANT, TORONTO, ONT.

"The House that Jacks Built"

Look behind the Graybar tag

Everything Electrical GraybaR ELECTRIC COMPANY

LOOK TO THREE E
for High Voltage Switches and Accessories

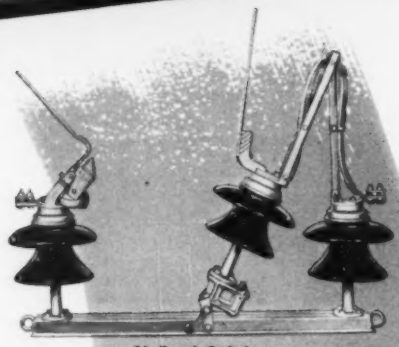
More than forty years ago the Electrical Engineers Equipment Co. began making high voltage switches and allied equipment. They have been busy making and improving them ever since.

Today their products represent the latest developments in the art of high voltage switch building.

The manufacturing skills attained, and the experience accumulated over four decades can be summed up in two simple words "KNOW HOW".

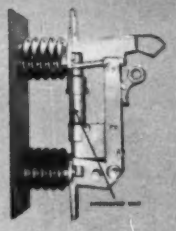
THREE E HAS IT

THREE E make five different types of Air Break Switches for voltages ranging from 7,500 to 230,000.

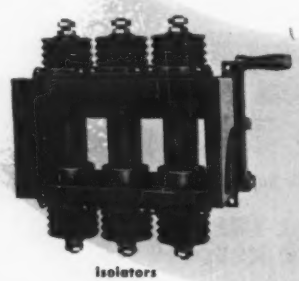


Air Break Switches

Spool Insulators



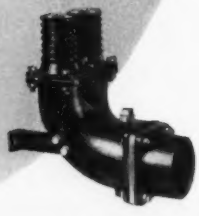
Interrupter Switches



Isolators

Disconnects

Bus Supports



Cable End Bells

The next time you need Switches, bus supports, Cable End Bells, Isolators, etc., select "THREE E"

THREE E — ELECTRICAL ENGINEERS EQUIPMENT CO.
MELROSE PARK, ILLINOIS

Look behind the Graybar tag

GRAYBAR Everything Electrical GraybaR

EVERSTICK ANCHORS

FOR TOUGH ANCHORING JOBS!

Today's anchoring jobs bring Eversticks to the forefront. They provide tight, safe anchoring . . . always in excess of rated capacities. Easy and quick to install . . . made of finest grade malleable iron with superior rust-resisting qualities and exceptional toughness. Every Everstick is plainly marked for ease of handling and storing.

The nut housing feature of the Everstick prevents rod from slipping thru while installing and provides a solid substantial base for the expanding blades.

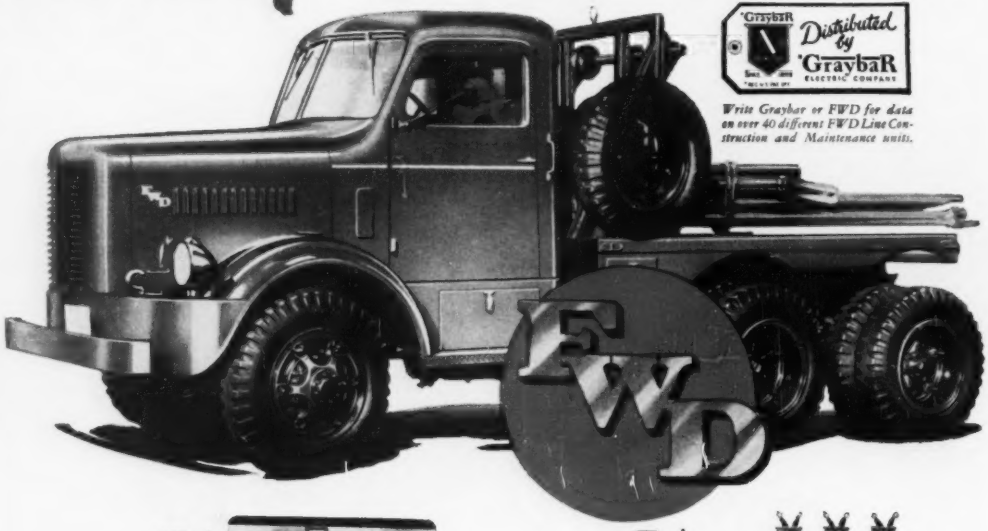
There's a complete line of Eversticks for all strain requirements. 15 sizes of 2-way—3-way—4-way types.

EVERSTICK ANCHOR CO., Fairfield, Iowa

Look behind the Graybar tag

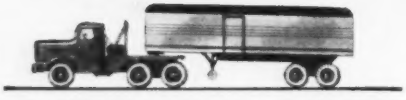
Choose More than a Truck

Choose an FWD H6x6 a Truly all-purpose Utility Truck Unit

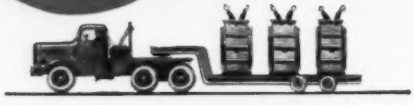


Distributed by GraybaR ELECTRIC COMPANY

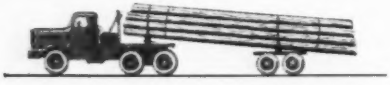
Write Graybar or FWD for data on over 40 different FWD Line Construction and Maintenance units.



Got a "semi" with a transformer oil purifying unit? Haul it with an H 6 x 6. Fifth wheel recesses in platform.



Transporting heavy transformer is no problem with a low-bed trailer and a powerful FWD H 6 x 6 on the job.



You can take the trouble out of big pole hauling. Bolster fits H 6 x 6 platform quickly and easily.

You can make a train-hitch job for bulky trailer loads. H 6 x 6 platform is free for other equipment.

You'll find FWD H 6 x 6 a sound answer to the need for a multi-purpose utility unit. FWD's extra traction means added safety with better distribution of weight and power — easier going on or off the road. But you'll want to get the complete story on FWD completely-equipped, utility-engineered units.

THE FOUR WHEEL DRIVE AUTO CO., Clintonville, Wis. • Canadian Factory — Kitchener, Ontario

World Wide Sales and Service

America's Foremost Heavy-Duty Truck

Look behind the Graybar tag

Everything Electrical GraybaR ELECTRIC COMPANY

MUTUAL ENDORSEMENT

- BARE WIRES AND CABLES
- OK*—PEERLESS*—TIP-TOP* WEATHERPROOF WIRES
- GUARDIAN* BUILDING WIRES AND CABLES—THERMOPLASTIC AND RUBBER INSULATED
- ROMEX* AND ROMEX-T. NON-METALLIC SHEATHED CABLES
- VARNISHED CAMBRIC POWER AND CONTROL CABLES, THERMOPLASTIC AND THERMOSETTING JACKETED, BRAIDED, OR LEAD SHEATHED
- ASBESTOS AND ASBESTOS VARNISHED CAMBRIC WIRES AND CABLES
- SUPER SERVICE S* AND OTHER PORTABLE CORDS AND CABLES
- MAGNET WIRE OF ALL TYPES

* TRADE MARK REG. U. S. PAT. OFF.

IN PROCUREMENT... Two fundamentals apply, always. 1. Pick yourself a reliable source of supply. 2. Specify a definite manufacturer's product, for quality's sake...This page displays two names to which you can pin your faith, under all circumstances. Everything you need is there—modern-specification insulation; quality-guaranteed construction; intelligent, cooperative service—"MORE POWER TO YOU".

GENERAL CABLE
CORPORATION

OFFICES IN PRINCIPAL CITIES

Look behind the Graybar tag

Everything Electrical
GraybaR
ELECTRIC COMPANY

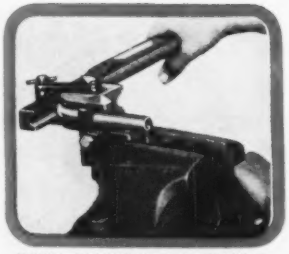
Speed, simplify

electrical construction jobs...cut costs...

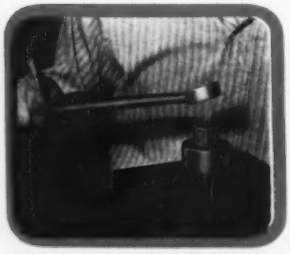
with GREENLEE timesaving tools for electrical work

GREENLEE HYDRAULIC CONDUIT BENDER

Conduit installations go far faster . . . neat, tailor-made jobs result every time with a GREENLEE Bender. Many owners report labor savings from 50% to 90% . . . and the cost of many manufactured bends and fittings is eliminated. For, with the GREENLEE *one man* in but minutes makes smooth, accurate bends in pipe up to 5", rigid and thin-wall conduit, tubing and bus bars. Compact and portable, the GREENLEE Hydraulic Bender can be easily and quickly moved for *on-the-job bending* exactly where and when wanted! Users say it often pays for itself on the very first job. Get facts today.



HAND BENDERS FOR TUBING
For quickly making small-radius bends, up to 180°, without flattening or kinks. Saves up to 75% in time and materials on many jobs. Various models and sizes to fit your work.



KNOCKOUT PUNCHES AND CUTTERS
Here's the quick, easy way to make knockout enlargements for ½" to 4" conduit. Simply insert GREENLEE Knockout Punch in knockout or small drilled hole, then turn with an ordinary wrench.

HydraRam KNOCKOUT PUNCH DRIVER
This powerful portable hydraulic tool drives GREENLEE Knockout Punches through 10-gauge metal in a jiffy. Drives all sizes of GREENLEE punches to make openings for ½" to 4" conduit.

SEE YOUR ELECTRICAL DISTRIBUTOR...

. . . get complete information on the above and other GREENLEE timesaving tools: Hydraulic Pipe Pushers • Cable Pullers • Joist Borers • Electricians' Auger Bits • Bell Hangers' Drills • Bit Extensions • Expansive Bits • Spiral Screw Drivers • Automatic Push Drills • and many more. Greenlee Tool Co., 1806 Columbia Avenue, Rockford, Illinois.

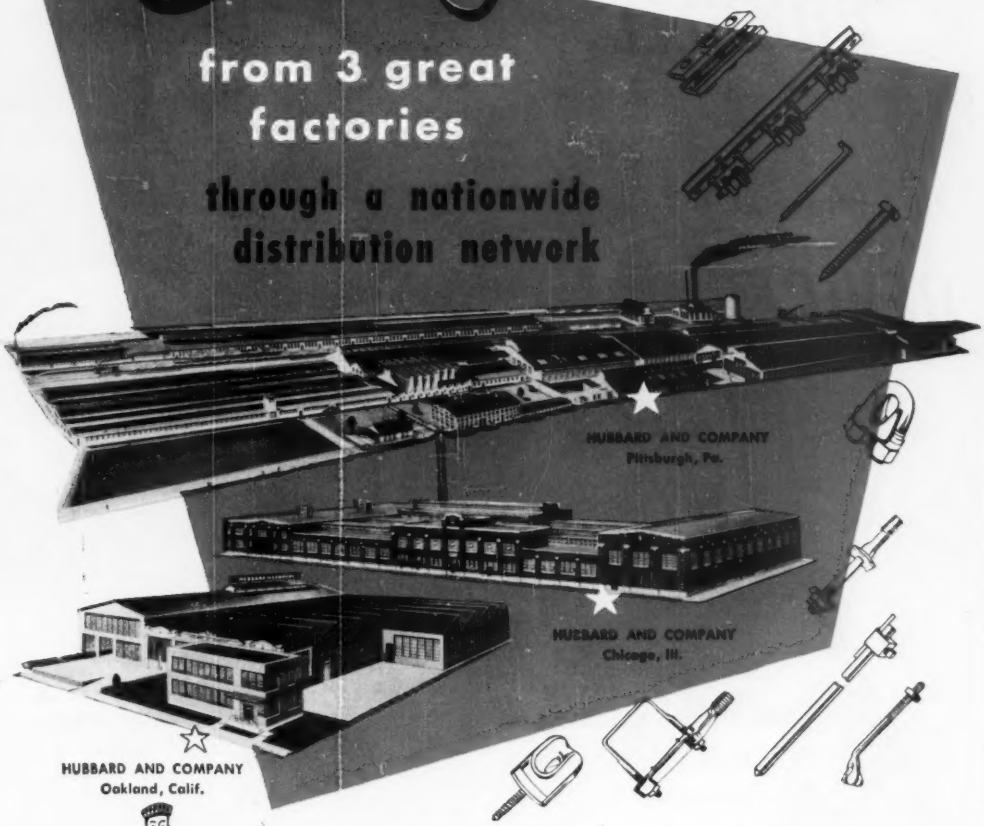
Look behind the Graybar tag

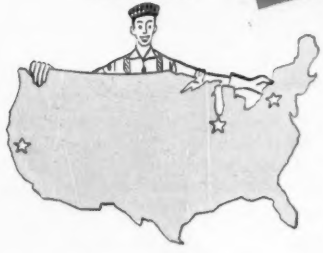
GRAYBAR Everything Electrical GRAYBAR

Serving the nation

from 3 great factories

through a nationwide distribution network





Hubbard products are stocked by Graybar at more than 100 locations throughout the United States.

Hubbard and Company began the manufacture of Pole Line Hardware when the Electrical Industry was in its infancy, and its growth has paralleled that of the power and communication systems.

Today three great plants, strategically located in Pittsburgh, Chicago, and Oakland, California, manufacture over 4000 items which are distributed to customers in 48 states and many foreign countries.

With confidence in the future of the industries which it serves and in the future of our nation, Hubbard continues its program of constantly expanded facilities and services.

HUBBARD AND COMPANY

PITTSBURGH • CHICAGO • OAKLAND, CALIFORNIA

"Hang the Load on Hubbard Hardware!"

Look behind the Graybar tag

Everything Electrical Graybar Electric Company

They never disconnect accidentally!

HUBBELL *Twist-Lock* TRADE-MARK DEVICES

Locked electrical connections are extremely important with industrial oil burners, and with heaters on equipment in the laboratory.

HUBBELL *Twist-Lock* TRADE MARK **Devices eliminate annoying delays because they never disconnect accidently—are vibration-proof and assure a lock-fast electrical connection under the most trying conditions.**

FOR BEST RESULTS USE GENUINE HUBBELL *Twist-Lock* DEVICES

HARVEY HUBBELL, INC. HUBBELL **BRIDGEPORT, CONN.**

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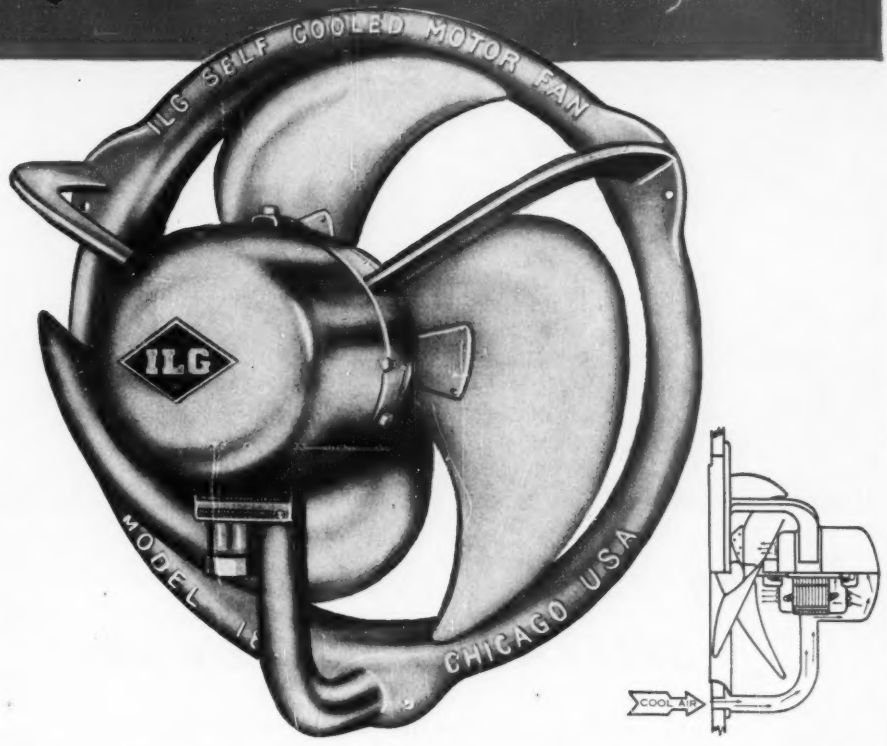
GRAYBAR *Everything Electrical* GRAYBAR ELECTRIC COMPANY

...why not buy the best?

ILG NEW TYPE "Q"

REG U.S. PAT. OFF.

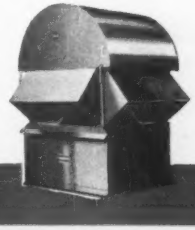
SELF-COOLED MOTOR PROPELLER FAN



Proved in multi-thousands of kitchen and attic ventilation installations, you can now get the ILG Type "Q" fan design in all sizes from 6" through 48" fan wheels inclusive, for commercial and industrial applications. Certified ratings (NAFM and/or PFMA labels) testify to remarkable capacity. Decibel ratings vouch for amazingly quiet operation. All of ILG's famous features for high efficiency, power-saving economy, minimum maintenance, and long life are built in. Included is the exclusive ILG Self-Cooled Motor, specifically designed for exhaust fan duty—no foul air reaches it to interrupt service, shorten its life. Each fan carries the ILG "One-Name-Plate" Guarantee, covering *both* fan and motor. Get complete information and prices from your nearby Branch Office or write us.

New! ILG type "PRV" power roof ventilator

Get positive, controlled ventilation, independent of wind or weather conditions in buildings with vertical flues or duct systems. Non-overloading, backward curved wheel direct-driven by self-cooled motor. Air control accessories. Exceptional air deliveries. Pressures range from free air to 1½" SP. Weatherproof housing. Compact, rugged, precision built, highly efficient. Easy to install and service. "One-Name-Plate" Guarantee. Call nearby Branch Office (consult classified directory), or write for new engineering bulletin No. 1901.



ILG ELECTRIC VENTILATING CO., 2885 N. Crawford Ave., Chicago 41, Ill.
Offices in more than 40 Principal Cities

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'GraybaR Everything Electrical 'GraybaR ELECTRIC COMPANY

- Belt Sanders
- Bench Grinders
- Drills
- Drill Stands
- Fender Hammers
- Grinders
- Electric Hammers
- Impact Wrenches
- Nibbler
- Nut Setters
- Polishers
- Sanders
- Saws
- Screw Drivers
- Tappers
- Valve Refacers

AN ELECTRIC TOOL TO SPEED EVERY ELECTRIC JOB!

Make mine Silver Line! Contractors throughout the country are echoing that phrase—Thor Silver Line, the only really new, modern portable electric tools, proving time and money savers on jobs everywhere. There's a size and model for every type of application—see your Thor distributor for a demonstration, or call your Thor branch.

BUY IT from your DISTRIBUTOR

Write for new E-2 universal electric tool catalog.

Thor PORTABLE POWER TOOLS

ASK FOR THE Silver Line

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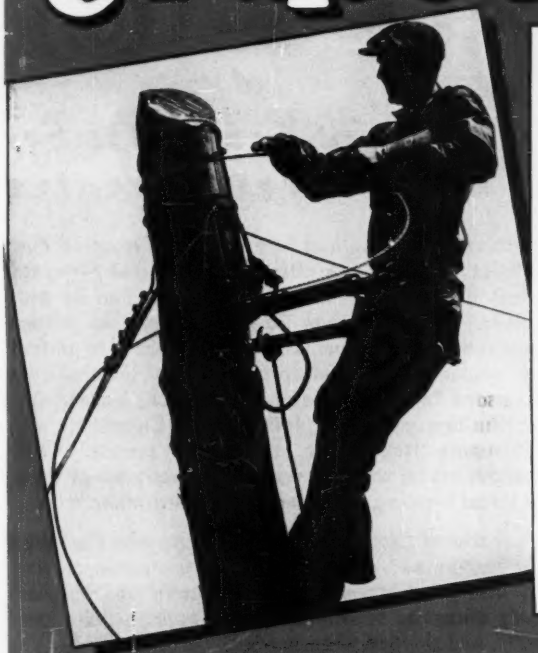
Graybar Everything Electrical Graybar Electric Company

Crapo Steel Strand



For Guys, Messenger and Overhead Ground Wire, Specify Crapo Strand!

Strength, ruggedness, workability, long-life are combined — with all-important **economy** — in Crapo Galvanized Steel Strand.

The superior tensile strength of the steel is utilized to fullest advantage in each size and grade. The heavy, ductile, tightly-adherent galvanized zinc coating — applied by the famous Crapo Process — provides dependable protection for the steel, prolongs the life of the strand.

There is a size and grade of Crapo Galvanized Strand for every practical need. Contact the nearest Graybar house or ask the Graybar representative for further information!

INDIANA STEEL & WIRE CO.
MUNCIE, INDIANA

PREFORMED ARMOR RODS

Protect and Reinforce Your Conductors at Small Cost

PREFORMED ARMOR RODS provide a **simple, practical, economical** method of reinforcing and protecting overhead conductors and static wires at the point of, and in the region of, the supports.

Accurately designed and preformed to prescribed length and pitch, these spiral rods form a snug-fitting, compact, cylindrical armor over conductor or static wire. Easily and quickly installed by hand or they can be applied with special "hot-line" tools. **No clamps or clips** required.

PREFORMED ARMOR RODS also are being used successfully to repair multi-stranded conductors and to reinforce worn conductors. Produced in Galvanized and Stainless Steel, Aluminum, Copperweld and Copper or Bronze. Ask your Graybar representative for details!

INDIANA STEEL & WIRE CO.
MUNCIE, INDIANA

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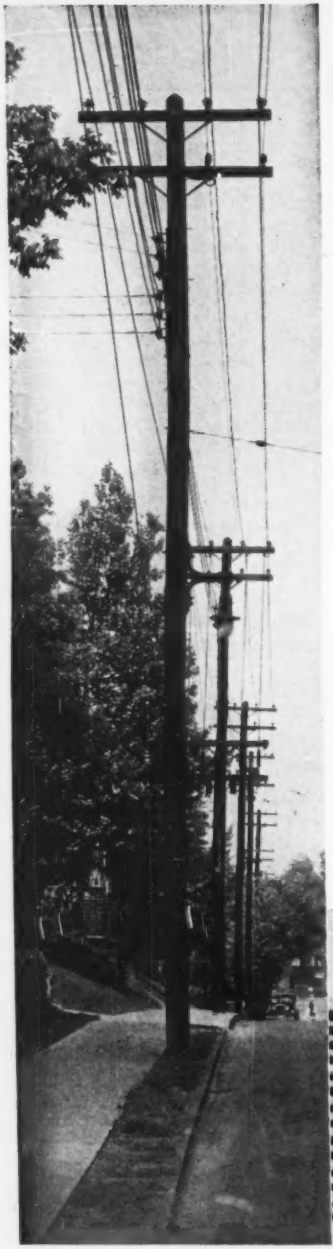
GRAYBAR Everything Electrical GraybaR ELECTRIC COMPANY

DEPENDABLE *Poles*

of

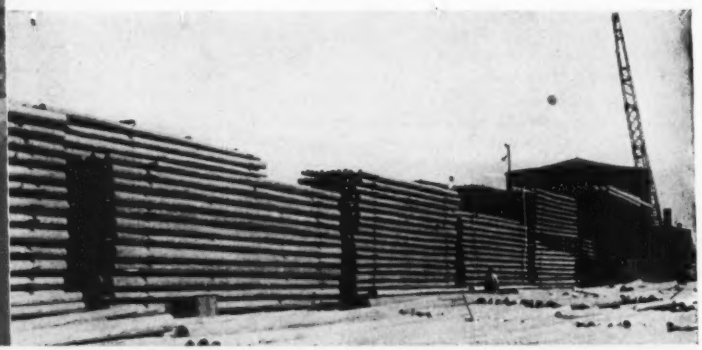
Selected Sound Timber
Scientifically Treated



THE lasting strength of International Creosoted Pine Poles plus their low ultimate cost makes them the safest and most economical poles that can be purchased. For more than 70 years, numerous service records of pole treatments have been utilized to perfect the present production practices for International Creosoted Poles. As a result of the lessons learned during this long experience, International Creosoted Poles will assure trouble-free, continuous service. Their straight, clean, smooth surfaces perfectly adapt them for street lighting, rural and urban distribution.

International Creosoted Pine Poles are manufactured and distributed by two of the oldest companies serving the utility industry. They have grown up together, ready always to serve with quality poles, framed correctly, and shipped when needed.

Distributed by GraybaR



INTERNATIONAL CREOSOTING & CONSTRUCTION CO.
PRODUCERS OF HIGH GRADE TREATED TIES, POLES, PILES, ETC.
Galveston — Beaumont — Texarkana

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Everything Electrical GraybaR

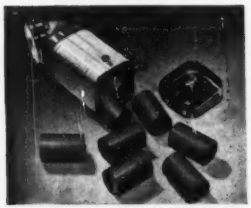
HERE'S THE FLASHLIGHT

THAT'S FAST REPLACING OTHER PORTABLE LIGHTS OF *ALL* KINDS AMONG

CONTRACTORS
INDUSTRIAL USERS
MAINTENANCE MEN
RAILROADERS AND
SPORTSMEN!

IT'S THE NEW JUSTRITE *Yellow-Flash 8*

The Justrite Model 2108 is the most powerful flashlight made. Eight standard flashlight batteries give up to 9,000 candlepower . . . a 2,500 foot beam. That's six to seven times the intensity provided by the conventional two-cell light—two to three times the intensity of the usual hand lantern—a beam power that equals or exceeds that of hand lanterns several times larger. And, the *Yellow-Flash 8* measures only eight inches overall. It slips easily into glove compartment or tool box. Value? List price is only $3.95 less batteries.



Special exclusive "convertible circuit" allows use of a standard 6-volt lantern battery for longer life economy light when lower intensity is satisfactory. Case is finished in high-visibility yellow, built of rust proof metal throughout. Light unit is fully adjustable and carrying handles fold flat against case.

Check your requirements today. *Get power, compactness and value all in one flashlight!*

JUSTRITE MANUFACTURING COMPANY
2063 N. Southport Ave., Dept. M-13, Chicago 14, Ill.

The Justrite line also includes these flashlights and lanterns

No. 1717S
Approved Safety
Flashlight

No. 2144S
Approved Safety
Lantern

No. 2140
Railroad Trainman's
Lantern

No. 2198
Yellow-Flash
Lantern

No. 1938
Yellow-Flash
Headlight

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Everything Electrical GraybaR ELECTRIC COMPANY

Better LIGHT... means better "sight"!

Model VL-440

The "Officer"—Leader's finest fluorescent fixture for all commercial interiors where beauty of appearance is as necessary as lighting efficiency. Available for 2, 3, or 4 40-watt lamps (VL-240, VL-340, VL-440) also for Slimline lamps in lengths from 48" (VL-448) to 96" (NHC-280, NHC-380, NHC-480).

Model IUO-240

The "Stratoliner"—Highly efficient, heavy-duty, all-steel industrial fixture. Removable end caps and turret-type sockets for easy servicing. Open and closed end models for 2 or 3 40-watt lamps (IUO-240, IUO-340) or 2 100-watt lamps (IUO-2-100).

Employees see more . . . do more with LEADER fine fluorescent fixtures

Large amounts of light without confusing shadows or glare that interferes with sight help everyone get more done, every day, in a well-planned, modern business. Office workers and plant personnel alike benefit from the right kind of light at the right place, at the right time . . . and production is stepped up all along the line.

Leader fluorescent fixtures, always a step ahead in design and engineering, offer you the widest possible selection of fine luminaires to choose from . . . for the right *kind* of installation in any situation. Leader *quality* is your assurance of satisfactory performance. To get acquainted with the Leader line, write for catalog, today!

Leader

America's No. 1 Lighting Equipment Manufacturer

Sold and installed by the better electrical dealers and contractors

LEADER ELECTRIC COMPANY • 3500 N. Kedzie Avenue • Chicago 18, Ill.

Leader Electric—Western: 800 One Hundredth Avenue • Oakland 3, California

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It Pays to have the Right Equipment

Extension Ladders
Sectional Ladders
Carrying Hooks
Diggers
Peevies
Cant Hooks
Shovels
Digging Bars
Pike Poles
Pike Pole Guards
Pole Supports
Tamping Bars
Spoons
Axes
Cant Hammers
Folding Gaffs
Safety Belts

OSHKOSH

POLE LINE TOOLS

LEACH COMPANY • OSHKOSH, WISCONSIN

Write for full line catalog

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GTEWER Everything Electrical GraybaR ELECTRIC COMPANY

"EVEREADY" NO. 1050 FLASHLIGHT BATTERIES GIVE *DOUBLE* THE USABLE LIGHT!

THE REVOLUTIONARY, super-potent "Eveready" No. 1050 flashlight battery gives you more than twice as much usable, brilliant white light for critical uses as any other flashlight battery National Carbon has ever made. It provides more light-energy output to the lower, cutoff points. Here are some advantages:

- **Whitest, brightest light available from a flashlight battery**
- **Half the cost for light output**
- **Leakproof — no metal can to leak or corrode**
- **Will not stick, swell, or jam in the flashlight**

Why? Because of the *exclusive,* "inside-out" construction of the "Eveready" No. 1050 battery. This new battery has the carbon lined jacket outside, zinc vanes inside. Inert carbon wall keeps battery sealed even when zinc is consumed and battery is exhausted. This results in a leakproof battery that will not swell, stick or jam and gives brighter light longer. Order a supply of "Eveready" No. 1050 flashlight batteries today!

The term "Eveready" is a registered trade-mark of

NATIONAL CARBON COMPANY

Division of Union Carbide and Carbon Corporation

30 East 42nd Street, New York 17, N. Y.

District Sales Offices: Atlanta, Chicago, Dallas, Kansas City, New York, Pittsburgh, San Francisco

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Everything Electrical GraybaR ELECTRIC COMPANY

New O. Z. CATALOG-PRICE BOOK

IT'S YOURS!

• • • a standard size, complete, non-technical, fully illustrated price book.

Yes, it's yours for the asking…a handy, compact, easy reference manual with illustration, catalog number, price, and weight of every item in the O.Z. line of high-quality electrical fittings. All the information you want, indexed *three* ways (by photo, product name, and catalog number) for convenient use by distributors' counterman, electrical contractors, estimators, and many others.

Write now on your firm letterhead, ask for Catalog 130. Your copy will be mailed promptly.

"They're OK if they're O.Z."

CONDUIT FITTINGS
CABLE TERMINATORS
CAST IRON BOXES
SOLDERLESS CONNECTORS
POWER CONNECTORS
GROUNDING DEVICES

O.Z. ELECTRICAL MANUFACTURING COMPANY, INC.

262 BOND STREET · BROOKLYN 2, N. Y.

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Everything Electrical GraybaR

"Light Magic"

FOR WORKING WONDERS in PLANNED LIGHTING!

"Pittsburgh" Permaflector

TWO NEW 48" and 96" SLIMLINE LUMINAIRES

THE "WASHINGTON" SLIMLINE LUMINAIRE features an egg-crate louver bottom and Skytex satinol glass side-panels. It is made in 2, 3 and 4 lamp models. Standard operation is 425-MA with T-12 Lamps. Bridge-truss construction assures a unit which "hugs" the ceiling when it is surface mounted.

THE "HARRISON" SLIMLINE LUMINAIRE, in 2, 3 or 4 lamp models. Gracefully curved side-panels, flat bottom-panels of Alba-Lite glass distinguish this modern slimline luminaire. Companion incandescent units are designed especially for use with the "Harrison" and other Presidential Fluorescent Luminaires.

The flexibility of Pittsburgh Permaflector Lighting Equipment is a modern miracle of design and construction.

For example—Pittsburgh Permaflector Slimline Luminaires are available in 48" and 96" lengths. They may be surface or pendant mounted, individually or end-to-end. When used with companion incandescent down-lights, they can be installed to form squares, rectangles, "T's", cross-overs, checkerboards and other patterns.

Such flexibility allows you full creative expression and makes possible "custom designed" lighting results with economical *standard* equipment.

Write today for more information on these versatile units.

PITTSBURGH REFLECTOR COMPANY

408 OLIVER BUILDING • PITTSBURGH 22, PENNSYLVANIA

MANUFACTURERS OF FLUORESCENT & INCANDESCENT LIGHTING EQUIPMENT

Permaflector Lighting Engineers in All Principal Cities

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Graybar Everything Electrical Graybar Electric Company

"Adds Years to Cable Life

That's why I specify

ORANGEBURG

Time-Tested Conduit"

—says Utility Engineer

● **For 58 years specifying Orangeburg Conduit has meant specifying maximum protection for underground electric cables at minimum cost.**

Orangeburg will not corrode. Lasts indefinitely. Impermeable wall and tight joints prevent corrosive ground waters from entering. Low coefficient of friction keeps pulling tensions to minimum. Protects cable sheath from abrasion when pulled in — also from wear during cable movement due to alternate expansion and contraction with changing loads. Resists acids, alkalis, grease, oil.

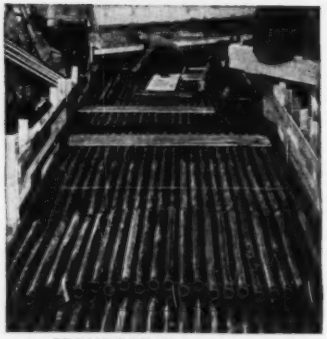
Orangeburg lays faster and at lower cost than any other type of conduit. Light, easy to handle and tool on the job. Tough, resilient — will not crack or break when properly handled.

It *always* pays to specify Orangeburg — *original* fibre conduit . . . because Orangeburg can *always* be depended on to provide a time-defying raceway for electrical services underground.

ORANGEBURG MANUFACTURING CO., INC., ORANGEBURG, N. Y.

ORANGEBURG *Fibre* CONDUIT

STANDARD *installed with Concrete* · **NOCRETE** *installed without Concrete*



STANDARD for three or more ducts . . . installed *with* concrete encasement.

NOCRETE for one or two ducts . . . installed *without* concrete encasement.

GraybaR ELECTRIC COMPANY

"FOR TOMORROW'S BETTERMENTS"

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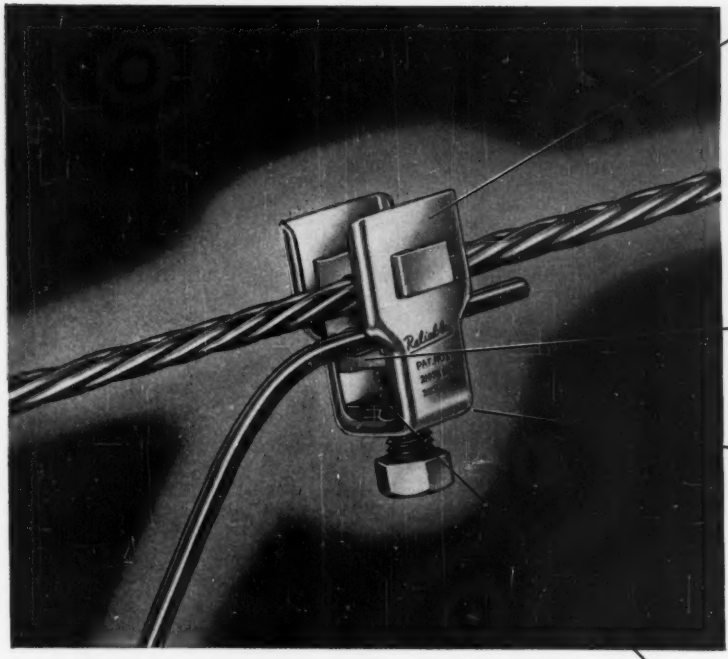
Accents on Accuracy



in the manufacture of

FLIP-ON TAP CLAMPS

Rugged, Reliable connections are assured with these precision Flip-On Tap Clamps. Accurately gauged threads and spacers always work smoothly—snug-up tighter, and then stay tight—while large bearing surfaces protect the conductors from damage. Carefully designed and carefully made, all parts are accurately heat treated. Their lighter construction of aluminum alloy reduces vibration fatigue. And where dissimilar conductors are used, spacers are provided with both copper and aluminum faces—to prevent electrolytic corrosion. Spacers accurately align conductors under screw pressure so that the joint gets the full benefit of direct (1:1 ratio) pressure. Reliable's accent on accuracy assures quick and easy installations—rugged, Reliable performance.

1. Precision dies and faultless equipment produce rugged body — wall slots are accurately parallel for easy, reliable pressure-clamping.

2. Exact manufacturing techniques assure these carefully engineered spacers give firm, reliable connections — without damaging conductors.

3. Nut is staked in body before tapping. Four full threads are continuous. Aligning fixture insures accuracy of direction. Pressure on conductors is directly under screw in opposite directions (ratio 1:1).

4. Accurately controlled electric furnaces bake long life and reliability into this tough aluminum alloy.

POWER-LINE CONNECTORS
AND
CONSTRUCTION SPECIALTIES

Reliable ELECTRIC COMPANY

3145 CARROLL AVENUE, CHICAGO 12, ILLINOIS

OVER 40 YEARS OF SERVICE TO THE UTILITIES

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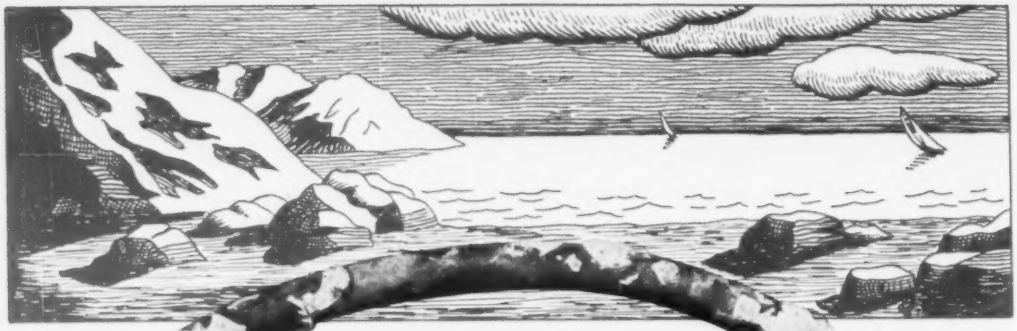
Everything Electrical
GraybaR
ELECTRIC COMPANY



NEITHER SURF, NOR ROCKS, NOR BARNACLES....

This "beat-up" looking piece of TIREX Cord is a veteran of many battles with the sea. Here's an excerpt from a field report describing its performance.

> "TIREX Cords and Cables have been found to be the only product that can be counted upon to withstand consistently the severe abuse to which they subject cables in their research work. One instance was given: A TIREX Cord led from a heavy instrument located on the ocean bottom several hundred yards from the shore, through the surf and over a rocky water line to the point where they were taking readings. After an unexpected storm they found this heavy instrument cast far up on the beach with the cord still attached, but in a tangled mass. The instrument was a total loss but the cord was intact and was used again on many subsequent occasions without requiring repair."

Isn't that the kind of service you want from your portable cords and cables? Of course it is! You can be sure to get it if you specify and be sure you get Simplex-TIREX Cords and Cables. They're a product of Simplex Research.

Simplex Research gave you the first heavy duty, rubber-jacketed portable cord or cable; the first low water absorption insulation; the first rubber-jacketed underground cable. Besides these notable "Firsts" Simplex Research has provided a great many developments which have enriched the art of cable design.

TIREX is not made nor recommended to be used under water. However, the spectacular life of this TIREX Cord illustrates perfectly the inherent ruggedness of TIREX. This ruggedness has been deliberately built into all TIREX Cords and Cables. It is one of the "plus values" that you get when you use TIREX.

SIMPLEX-TIREX IS A PRODUCT OF SIMPLEX RESEARCH

SIMPLEX-TIREX

SIMPLEX WIRE & CABLE CO., 79 SIDNEY ST., CAMBRIDGE 39, MASS.

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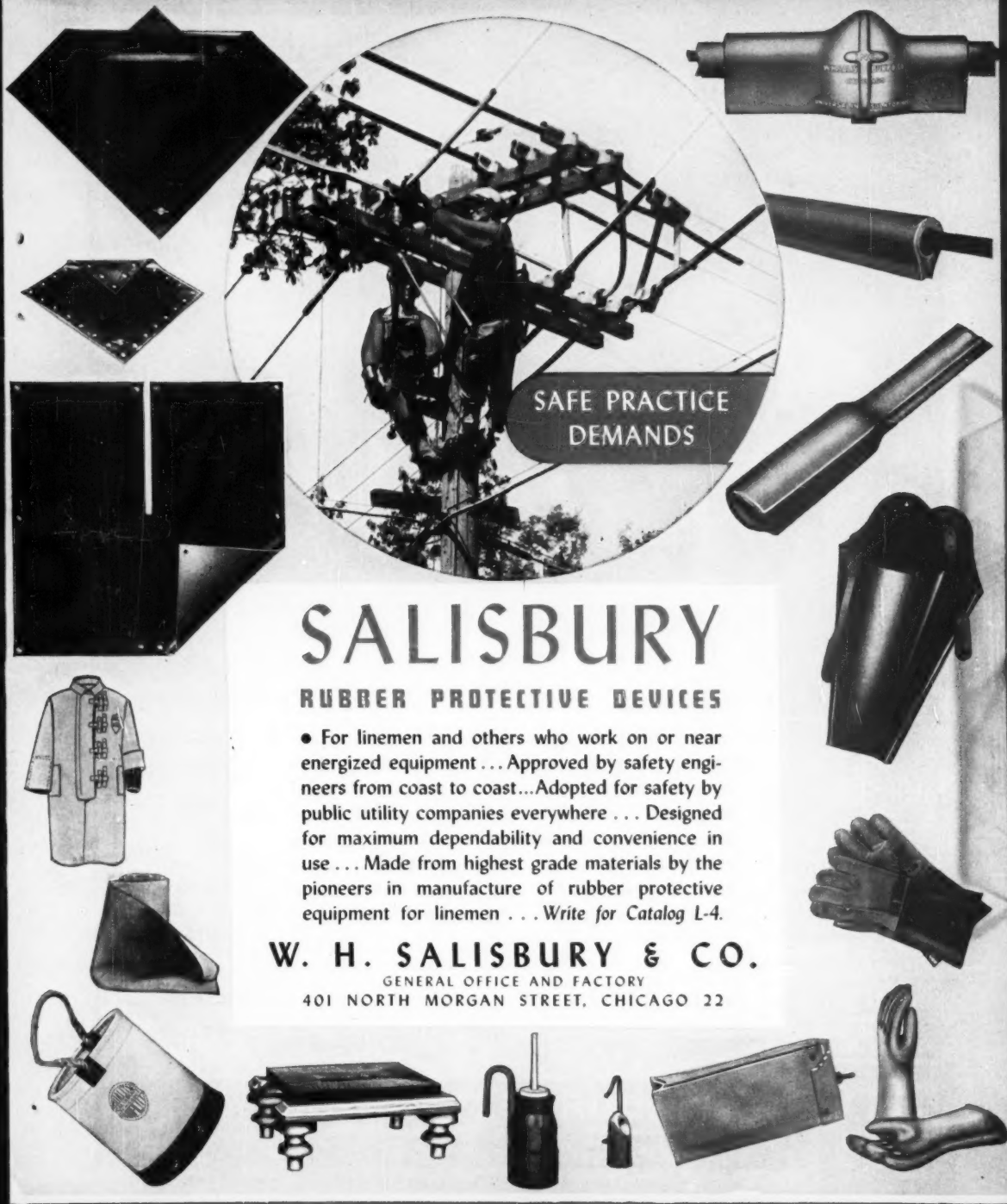
A DEVICE FOR EVERY ELECTRICAL HAZARD



SALISBURY

RUBBER PROTECTIVE DEVICES

• For linemen and others who work on or near energized equipment . . . Approved by safety engineers from coast to coast...Adopted for safety by public utility companies everywhere . . . Designed for maximum dependability and convenience in use . . . Made from highest grade materials by the pioneers in manufacture of rubber protective equipment for linemen . . . *Write for Catalog L-4.*

W. H. SALISBURY & CO.

GENERAL OFFICE AND FACTORY
401 NORTH MORGAN STREET, CHICAGO 22

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Everything Electrical
GraybaR
ELECTRIC COMPANY

SQUARE D's DESIGN LEADERSHIP

SAFETY SWITCHES

TYPES A*, C and D
30, 60, 100 and 200 Amp. Sizes

40 YEARS DESIGN LEADERSHIP

is reflected in the many design and operating features of this completely new line

Type A switches have full interlock, visible blades and magnetic arc plate as well as a simple, quick-make-and-break mechanism, dead front line terminals, positive pressure fuse clips, multi-spring jaws, silver-plated current carrying parts and removable pressure connectors.

**Types C and D resemble Type A in appearance but differ in construction details*

SAFETY SWITCHES and other Square D Products are distributed by GRAYBAR

SQUARE D COMPANY

DETROIT · MILWAUKEE · LOS ANGELES

SQUARE D COMPANY CANADA LTD., TORONTO • SQUARE D de MEXICO, S.A., MEXICO CITY, D.F.

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GRAYBAR Everything Electrical GraybaR

Skylike® blends 2 types of lighting units into 1

1. the soft, indirect light of silvered-bowl incandescent lamps.

2. the sleek, modern look of fluorescent-type troffers.

Silvray's SKYLIKE lighting system offers your commercial customers many advantages not found in any other lighting system, yet uses only silvered-bowl incandescent lamps.

Designed along modular concepts for recessed or semi-recessed use, SKYLIKE fixtures may also be surface-mounted in old or remodeled interiors without sacrifice in lighting quality.

Silvray SKYLIKE units are amazingly economical in initial cost—only ½ to ⅓ as much as other equipment delivering comparable results. Ease of maintenance permits similar savings — units can be relamped from the floor and require only an occasional cleaning with a damp cloth.

SKYLIKE features mean good news for contractors, too. Fixtures fit 24″ x 24″ ceiling tile . . . are light in weight, easy to handle, and require only minimum framing support. Simplicity in wiring and construction of SKYLIKE units eliminates costly service call-backs.

Here's *real* proof of SKYLIKE efficiency

These unretouched photographs demonstrate the versatility of the SKYLIKE louvered incandescent lighting system.

In each case, the only light source used was that of the SKYLIKE units—note the soft, even distribution of light . . . the complete absence of glare, harsh shadows, and sharp light cut-off lines.

Photo by Milton Mann Studio

A unique SKYLIKE application is pictured here in the showroom of Irving A. Belking Furs in San Francisco, California.

Notice how architect Bernard J. Saboroff's gridwork of 1 x 6 pine serves to hide the unsightly high ceiling, as well as to support the patterned group of recessed Silvray SKYLIKE units. Low brightness levels and 90° shielding provide an extremely satisfactory result.

Selected for warm color and ease of installation, surface-mounted SKYLIKE units replaced out-moded globe-type units in the remodernization of the Levy Brothers Store in Elizabeth, N. J.

Variable lamp sizes — from 150 to 500 watts — permit changes in lighting intensities. Units can also be converted for accent or directional lighting by use of a semi-silvered lamp and a simple accessory. S16-96

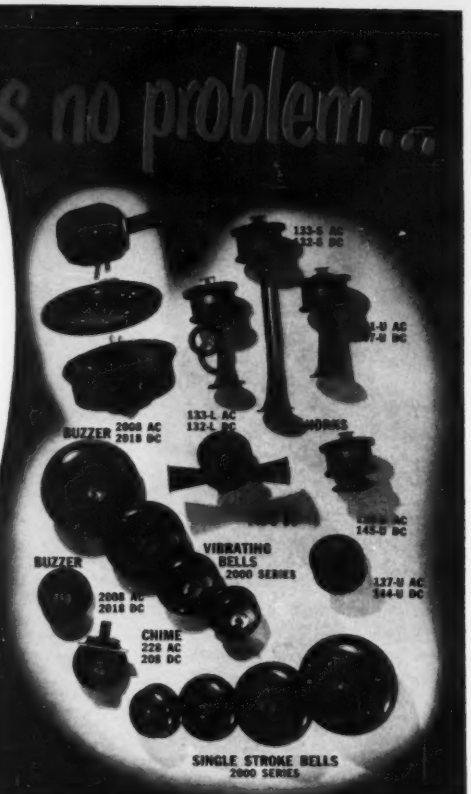
Send for complete SKYLIKE information. A comprehensive booklet describing the SKYLIKE system is yours for the asking. To get your copy, write: *Graybar Electric Company, Inc., Graybar Building, New York 17, N. Y.*

SILVRAY LIGHTING INC.

Look behind the Graybar tag

Plant conversion is no problem...

when you install a
Faraday heavy duty signal



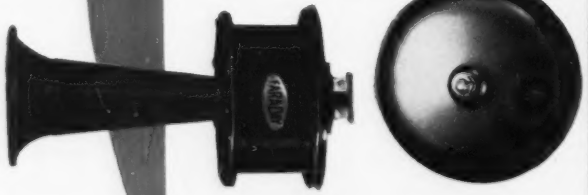
17 INTERCHANGEABLE UNITS

Regardless of constantly changing noise conditions in various departments, UNI-PACT's 17 interchangeable signals—bells, buzzers, horns, chimes—all fitting one adapter plate, give you complete control of the different "noise" levels. Because of this in-plant versatility, it makes any conversion problem easy with "tailor-made" units that allow for quick change.

UNI-PACT is easy to install. Just four simple steps—wire to the back of dead front adapter plate which fits standard four inch outlet box or condulet fitting. Secure adapter plate to box. Plug in UNI-PACT signal and secure with locking screws. For panel mounting, a special adapter plate with extra long terminals is furnished without charge when specified.

ATL-700 BELL

The highest quality in neck type vibrating bells, giving resonant clear tone at maximum sound output. It's weatherproof, has a cast frame, is easily connected to exposed conduit or outlet box. Available in 4"–6"–10" diameters.



121-S HORN

A rugged, heavy duty signal for general alarm, starting and dismissal signals in all types of industrial plants. Maximum signal strength, loud clear tone, instantaneous performance, long life are a few of its features.

Sprott Faraday Inc.

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Here's the first time and labor saving improvement in pole jacking in 25 years! New aluminum housing on The Simplex heavy-duty Pole Jack eliminates 35 pounds of weight, without sacrificing a pound of lifting capacity. You can pull or straighten poles, pull butts or move loaded poles without interruption to service — and without digging. Only 60 pounds in weight, it's easy to move from job to job; saves time and work.

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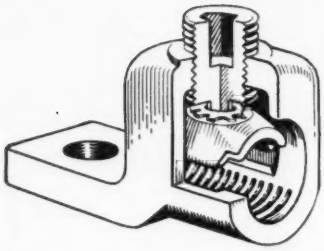

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Lock-Tite Lugs are typical of the many T & B quality fittings recently re-designed to give you outstanding performance at lowest installed costs. Like all T & B fittings, they're furnished 100% through local T & B distributors under the T & B plan.

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TAKE ANY CABLE
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ELECTRICAL INSULATION IS OUR SPECIALTY

Q. *What ONE wire and cable producer grows its own natural rubber, and makes its own synthetic rubber?*

A. UNITED STATES RUBBER COMPANY.

Q. *What ONE wire and cable producer makes plastics?*

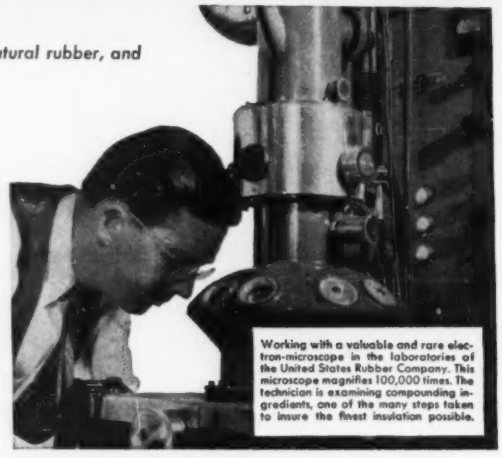
A. "U. S."

Q. *What is the most important part of wire and cable?*

A. The insulation.

Q. *Who is best equipped to make wire and cable with superior insulation?*

A. U. S. RUBBER—which grows its own natural rubber, makes its own synthetic rubber, manufactures its own plastics.



Working with a valuable and rare electron-microscope in the laboratories of the United States Rubber Company. This microscope magnifies 100,000 times. The technician is examining compounding ingredients, one of the many steps taken to insure the finest insulation possible.

Isn't it logical that a rubber company should make the best wire and cable insulation there is? U. S. Rubber has been a pioneer in insulation for over 70 years—has amassed in that time a stockpile of research data and experience that can't be beat. Electrical insulation is a "U. S." specialty!

Electrical insulation makes the difference between superior and ordinary wire and cable. Conductors of all manufacturers are standard, but insulation must be the best that science can produce. That's why your best bet in wire and cable is U. S. Rubber.

SOME MORE OF THE MANY DIFFERENT VARIETIES OF "U. S." WIRE AND CABLE

UTILITIES: Power Cables • Street Lighting • Royal Cords • Network Cables • Utility Control • Pole & Bracket Cable • Service Entrance • Weatherproof • Zip Cord Pole Fixture Cable • Sup. Control

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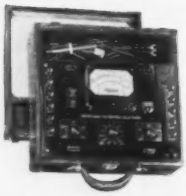

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(Model 622) High sensitivity, large scale A-C and D-C instruments of double pivoted type, ideal for precision measurement of low potentials and minute current. Available in single or multi range as D-C voltmeters, millivoltmeters, milliammeters, microammeters; and milliammeters and voltmeters in thermo and rectifier types for RF and A-C.

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(Model 931) Comprising a group of matched a-c and d-c portable test instruments; the universal favorites for highly accurate general test work. Available as voltmeters, ammeters, d-c and single phase a-c wattmeters—a-c and d-c voltmeters. Long, readable hand-calibrated mirror scales. The d-c instruments have new self-shielding mechanism.

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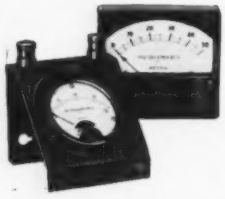

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Everything for your Pole Lines via GraybaR

WHAT THEY'RE SAYING
at industry meetings

Taxes, Buying, and Shortages

Charles Sawyer, *secretary, United States Department of Commerce, before the Economic Club of New York, New York City.*

Saving taxes by means of certificates of necessity gives a pleasant feeling while it is going on. I believe, however, that taxes will remain high and concerns which have used up a large amount of their possible depreciation allowance may be paying more rather than less taxes as the years go on.

Since we began to encourage planned expansion, production and buying have not been reduced; on the contrary, they have been increased. Total business sales for February 1950 were 32.3 billion dollars; for February 1951 they were 41.9 billion dollars. Last year business invested 18.5 billion dollars in new plants and equipment. My department estimates an investment of 24 billion dollars in 1951.

The same thing applies to shortages of materials. As the defense program expands, increasing quantities of materials are being diverted to filling defense orders. Shortages have not reached their peak; they will continue to mount for many months, some of them alarmingly.

A Major Duty

Luther D. Shank, *Building Materials Division, National Production Authority, at the Street Lighting Conference, Nela Park, Cleveland.*

Whether you are a manufacturer or a user of street lighting equipment, you have a major duty to conserve material, to use equipment wisely, and to maintain and service it so that you get the most out of it.

Plan wisely! Get what you need but don't hoard! In the long run, high prices and shortages hurt you most. Be on the alert for practical substitutes. We are not asking that you increase costs or lower quality. But we are asking that you make an honest effort to use less-critical materials whenever possible.

See that all junk and scrap metals are salvaged and returned to steel mills or copper and aluminum smelters. This year we must find 3 million tons more of scrap steel than was found last year. In 1952, we have to find 6 million more tons. Instruct your organizations to salvage every available bit of scrap metal, including old lighting standards, brackets, old streetcar tracks, and junk copper wire.

Shortage of Engineers

A. C. Monteith, *vice president, Westinghouse Electric Corp, at the joint meeting of Senior-Junior Engineers, American Institute of Electrical Engineers, Cincinnati.*

In this country engineers are in short supply and the outlook is very depressing. We will graduate 32,500 engineers in 1951; 22,000 in 1952; 17,000 in 1953; and 13,000 in 1954, if the draft does not interfere. With normal attrition we must have 60,000 engineers per year enter school to secure 30,000 graduates. These figures show that we will be short 40,000 by 1954.

Senate Bill S-1 recognizes the importance of continuing the training of young engineers. Under this bill, 75,000 students are to be relieved of universal military training and are to be allowed to go to school to provide personnel for scientific and engineering needs. We believe this figure should be 125,000.

Analyze the Human Component

E. Finlay Carter, *vice president of engineering, Sylvania Electric Products Inc, at a meeting of the Institute of Management, Dallas, Texas.*

It is hard to conceive a more complex component in our businesses today than the human element. Yet this component is not given nearly as much consideration as production machinery and other physical assets.

The answer lies in a better executive understanding of human beings, of their similarities and of their differences. The good executive should understand the motivations of interest in the work, inspirational leadership, faith in achieving a goal, and due recognition for a job well done. He should realize that the most effective drive is that which comes from within the individual. He should learn how that drive may be most effectively stimulated in each individual he leads. With this sort of understanding, and action, a wholesome mutual respect will be developed which cannot help but result in a winning team.

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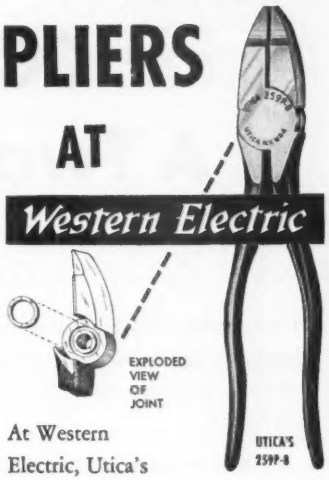

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AND THE WORLD'S BEST TOOLS ARE MADE IN U. S. A.

We Mobilize for Freedom

CONTROLS . . . A Two-Edged Sword

It may seem dangerously premature to talk about getting rid of emergency government controls while all-out war is still an imminent possibility.

But success in this strange struggle for our freedom into which the Russian Communists have plunged us requires that we:

1. Maintain a whole battery of controls designed to speed defense production and curb inflation, and at the same time

2. Work to end the controls at the earliest possible moment.

Here is the reason why this editorial—fourth in a special series on mobilization for defense—is devoted to the need for a speedy release from controls.

If the Russian Communists can force us to maintain indefinitely the present system of government controls, they will have won a tremendous victory. They will have saddled us with a system of collectivism which, over a period of years, would be fairly certain death to freedom of business enterprise.

Make no mistake about it. This is not an argument against emergency controls. We need controls now to break a right of way for our mobilization program through the business boom. Indeed, the third editorial in this special series was titled "Why Controls Are Necessary." It stressed both the need for controls and the need for positive cooperation to make them work.

Controls Can Undermine Our Economy

But these controls surely chisel at the foundation of our normal economic system. So long as we have them, many if not most key business decisions will be made in Washington bureaus rather than in the free market place. For example, the *National Production Authority* administers a *Controlled* Materials Plan (italics ours) which directs the flow of basic metals, and decides who can use them for what purposes.

Happily, the people who operate these controls are not using the methods of a secret police state.

Even more happily, most of the leaders who have been drafted to manage the controls are not in love with their jobs. They are doing their best in the thankless task of making controls work. They recognize the danger of chronic controls.

But the fact remains that our economy is

operating under arrangements which carry it a long way toward the pattern of centralized control the Russians would inflict on the world.

The Wilson Plan

A plan for getting rid of these controls has already been developed. It was put together by our Director of Mobilization, Charles E. Wilson—while he was working day and night to set up the necessary emergency controls.

The Wilson Plan—if we escape all-out war—will strengthen our defenses and our economy. By 1953, it calls for:

1. Providing the weapons to equip an armed force of 3½ to 4 million, together with a supply of weapons for our allies.

2. Building a stockpile of weapons which, with current production, would be sufficient to carry on an all-out war for a year.

3. Building the manufacturing capacity by which we could rapidly expand our production of weapons if all-out war should come.

4. Increasing the productive capacity of industry enough to resume the expansion of our civilian economy.

With these jobs done our economy would be big enough and strong enough to meet both civilian and military requirements. And the government controls needed for mobilization could be speedily dropped.

Call for Sacrifice

The Wilson Plan requires a major effort—it means spending more than $50 billion a year for mobilization. That is almost 20 percent of our total production. And this cannot be done without sacrifice. For a time, particularly in the next year, living standards will drop.

But the sacrifice required is amazingly small. At the peak of the defense effort, civilians will still have available to meet their needs about as much as they did in any year before 1948.

To make the Wilson Plan succeed we must curb inflation. A second year of inflation such as that which we have had since the Korean war started would multiply disastrously the costs of our defense program. One key part of a successful program to curb inflationary pressure, which soon will be building up again, is a pay-as-we-go tax program. The second editorial in this series urged that we do our utmost to pay as we go.

We Cannot Out-Control the Communists

But, above all, to make the Wilson Plan work we must keep our sights set on the crucial importance of increased production. Our problem is to increase our capacity to produce so that we can carry both a major military program and an expanding civilian economy for as many years—General Bradley thinks it might be fifteen or twenty—as the menace of Russian Communist aggression persists.

If we do not produce enough to do this double job, we shall be confronted with the prospect of having to live indefinitely under government controls of the sort that have been set up since the start of the Korean war. That would be delightful to the Russian Communists. It would go far toward making over our economy on the Moscow model.

Even if we wanted to, we never could hope to out-control the Russians. They are miles ahead of us in that line. But we can out-produce them, by a tremendous margin. By doing that we shall travel the surest road to victory.

McGraw-Hill Publishing Company, Inc.

NEWS ABOUT PEOPLE

Heffelman Is Promoted by New Mexico Utility

Malcolm C. Heffelman, division manager at Santa Fe for Public Service Co of New Mexico, has been named operating vice president of the company.

Ralph E. Loken will succeed Heffelman as Santa Fe manager. He has

M. C. HEFFELMAN

been treasurer of Public Service.

With Public Service and its predecessor, Federal Light & Traction Co, for the past 18 years, Heffelman joined the system as acting manager of Deming Ice & Electric Co. He later became president and manager of the company. He also served as vice president and then president of New Mexico Power Co.

When the New Mexico companies were reorganized as Public Service Co of New Mexico, Heffelman was made Santa Fe division manager. Last year he was elected president of the Rocky Mountain Electrical League.

He started his career with Phelps Dodge Corp at Bisbee, Ariz. Later he spent two years at Chuquicamata, Chile, supervising electrical construction for Chile Copper Co. Then he served as office engineer on irrigation projects for Loveland Engineers, Inc, Phoenix. He also worked for Central Arizona Light & Power Co and Tucson Gas, Electric Light & Power Co.

Loken joined Public Service after graduation from the University of New Mexico. He became treasurer in 1948. He will be succeeded by Ralph T. MacBain who will occupy the dual role of secretary and treasurer.

•

Lee C. Martin has been named chief engineer of Georgia Power & Light Co's steam plant at Waycross. He succeeds **Sam Fraley** who has retired. Martin has been assistant chief engineer of the plant since 1949. New assistant chief engineer is **James E. Scrivner.** Fraley, with the company since 1923, had been chief engineer at Waycross since 1932.

•

E. R. Taylor Appointed Hotpoint Vice President

Edward R. Taylor, general sales manager, has been elected vice president of Hotpoint, Inc. He will direct all marketing policies of the company.

Taylor joined Hotpoint in 1947 as merchandising manager, and later became market development and sales manager. Before becoming associated with Hotpoint, he was connected with the marketing of durable goods in the automobile, radio, and appliance industries.

•

A. F. Reinking, assistant sales manager, has been named manager of the Steam Turbine Sales Division of Worthington Pump & Machinery Corp. He will make his headquarters at the company's Wellsville plant. Reinking joined Worthington in 1927 and two years later went to Moore Steam Turbine Corp. He became associated with Worthington again when Moore was purchased by Worthington.

Walter A. Buchanan has joined the staff of Gibbs & Hill, consulting engineers of New York and Los Angeles, as general representative. Working for American Gas & Electric Co and subsidiaries he has been active in the construction, operation, maintenance, and management of electric utilities.

I. W. Wilson Appointed as President of Alcoa

I. W. Wilson, senior vice president, has been made president of Aluminum Co of America. He replaces Roy A. Hunt, president since 1928, who has

I. W. WILSON

been named chairman of the executive committee.

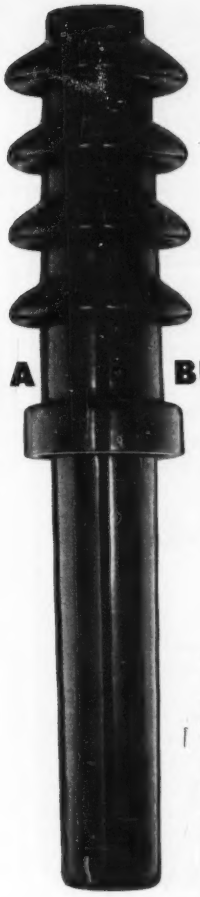
Wilson began his career with Alcoa in 1911 at Niagara Falls, N. Y. Ten years later he became general superintendent of the company's reduction plants. In 1931 Wilson was elected vice president in charge of operations. He was appointed senior vice president in 1949.

During World War II Wilson headed Alcoa's plant expansion program as well as the Defense Plant Corporation program carried out by Alcoa for the government. In recognition of his contributions to the war effort he received a Presidential Certificate of Merit.

•

E. V. Caton, chief engineer and manager of Winnipeg Electric Co, has been elected to honorary membership in the Engineering Institute of Canada. The institute, with a membership of 15,000, has only 23 honorary members.

W. B. Whalley, engineering specialist for Sylvania Electric Products, Inc, has been appointed adjunct professor in electrical engineering for the Poly-



THIS IS A BUSHING PORCELAIN

Nothing unusual about it, nor complicated, nor difficult from a porcelain-maker's standpoint . . .

. . . Except for some "special" considerations. A smaller-than-usual porcelain bushing could contribute substantially to economy in the complete assembly . . . *if* the porcelain bushing could withstand some rather sharp mechanical impacts encountered in service . . . *if* the bushing could be mounted with a lead alloy instead of customary cement . . . and *if* the electrical reliability of the porcelain were certain.

That sounds easy. And it is . . . for Lapp. Yet Lapp porcelain was one of very few found which met this set of requirements. This piece in Lapp porcelain developed almost twice the strength of that of some other porcelains tested. It won't crack under the strain of lead mounting. And, like every piece of Lapp porcelain, each unit gets a high-safety-factor electrical test before shipment.

The manufacturer who uses this Lapp porcelain bushing in his product knows that he is offering extra value to his customers when he says *"Porcelain by Lapp."* Also he realizes production economies resulting from elimination of factory troubles, assurance of freedom from rejects, close adherence to mechanical specifications, and elimination of need for testing these parts. So, although he pays somewhat more per piece for porcelain of Lapp quality than he would for the cheapest porcelain he could buy, he finds he is getting a bargain in all-over cost, performance, and prestige.

Do you look for the name on the *porcelain* in equipment used on your system? When you find Lapp porcelain, you'll know that the manufacturer of that equipment is willing to give you "something extra" as a guarantee of dependable performance.

For . . . *you can buy cheaper porcelain . . . you can't buy better porcelain* . . . than Lapp.

Lapp Insulator Co., Inc., Le Roy, N. Y.

Lapp

8:30 A.M. Inspector spots trouble and radios for repair crew—right from car.

Track down trouble...faster! with RCA 2-WAY RADIO

8:31 A.M. Dispatcher orders nearest crew to trouble-spot.

8:32 A.M. Truck gets rolling. No lost time. No lost mileage.

8:35 A.M. Repairs start immediately. Service is restored . . . FASTER!

SERVICE TRUCKS can be re-routed immediately to cover emergencies. Aimless driving is eliminated—large reserve fleets are not needed.

Messages can be exchanged between dispatcher and service crews whenever required. Installation . . . and maintenance . . . are accomplished with fewer return trips.

Cable-pulling, wire-laying, pipe-laying can be done faster and co-ordinated easier—through instantaneous communication. Load dispatchers can keep in constant touch with supply sources. Guesswork is eliminated! Outage time reduced! Service speeded!

For the facts about RCA 2-way radio, write Dept. Q-31, RCA Engineering Products, Camden, N. J. *(In Canada, write: RCA Victor Company Limited, Montreal.)*

Just Out—*new brochure tells how RCA 2-way radio systems can speed operations.*

RCA ENGINEERING PRODUCTS
Dept. R-31
Camden, New Jersey

Send me the new brochure on RCA 2-way Radio for Industry.

Name_____

Firm_____

Address_____

City_____ State_____

RCA RADIO CORPORATION of AMERICA

technic Institute of Brooklyn. He will continue his work for Sylvania, which has been in the television field. Formerly an assistant professor of engineering physics at Cornell University, Whalley worked on radar development for the Canadian government and engaged in research at the RCA Laboratories in Princeton, N. J., on radar and on transmitting tubes and circuits for television.

•

Philip N. Rugg Heads New England Engineers

Philip N. Rugg has been elected president of the Engineering Societies of New England, Inc, Boston. He is supervisory engineer in the technical

P. N. RUGG

services division of Boston Edison Co's electric and steam sales department.

The New England organization is an affiliation of 22 national engineering and technical societies.

Rugg has been with Boston Edison since 1927.

•

Herbert J. MacTavish, assistant general manager of the Toronto Hydro-electric System, has been named general manager of the municipal system. He replaces **E. M. Ashworth** who has retired. MacTavish joined the system in 1914 and has served as assistant to the general manager, becoming assistant general manager in 1946.

William C. Noll, manager of the technical and education section of General Electric Co's Product Service Division, has retired after nearly 45 years of service with the company. He recently was named to a post in the Office of Price Stabilization. He began his career with GE as a test engi-

Just Published!

NOMOGRAPHIC CHARTS

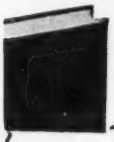
1. A collection of 92 time-saving charts for simplifying and speeding up engineering computations. The charts apply to mathematics and general engineering, the fields of hydraulics, mechanics, and thermodynamics, and electrical problems. They are accurate in a range between slide-rule computations and exact numerical computations, and each is followed by explanatory text. **By C. Albert Kuimann. 244 pages. $6.50**

ELECTRICAL TRANSMISSION LINES

2. For electrical and electronic engineers, and those interested in power and communications, here is a concise, authoritative presentation of the theory of circuits with distributed constants, which is valid at all frequencies, followed by chapters on the application of this theory to radio frequency lines, power lines, telephone lines, filters, and wave guides. **By Hugh H. Skilling, Professor of Electrical Engineering and Head of the Department, Stanford U. 437 pp., 158 illus., $6.50**

ALTERNATING-CURRENT MACHINERY

3. Here are the essential facts on transformers and the principle kinds of synchronous and induction machines, both polyphase and single phase. Covers construction and operational theory of each type, as well as connections, applications, and methods of control—with a treatment of special machines, motor design features, selsyn devices, rotor-bar currents, etc. **By Benjamin F. Bailey, and James S. Gault, both Professors of Electrical Engineering U. of Mich. 423 pp., 360 illus., $6.00**



CIVIL DEFENSE IN MODERN WAR

4. This timely book answers hundreds of questions on civil defense in modern warfare. It covers every aspect of defense against atomic, bacterial, and chemical warfare—tells about aircraft, guided missiles, poison gasses, incendiary bombs, radiation —with methods for protecting industries, communities, homes, and individuals, and a guide to a civilian defense program for national, state, and local governments. **By Augustin M. Prentiss, Brig. General, U. S. Army (Ret.), 429 pp., 64 illus., $6.00**

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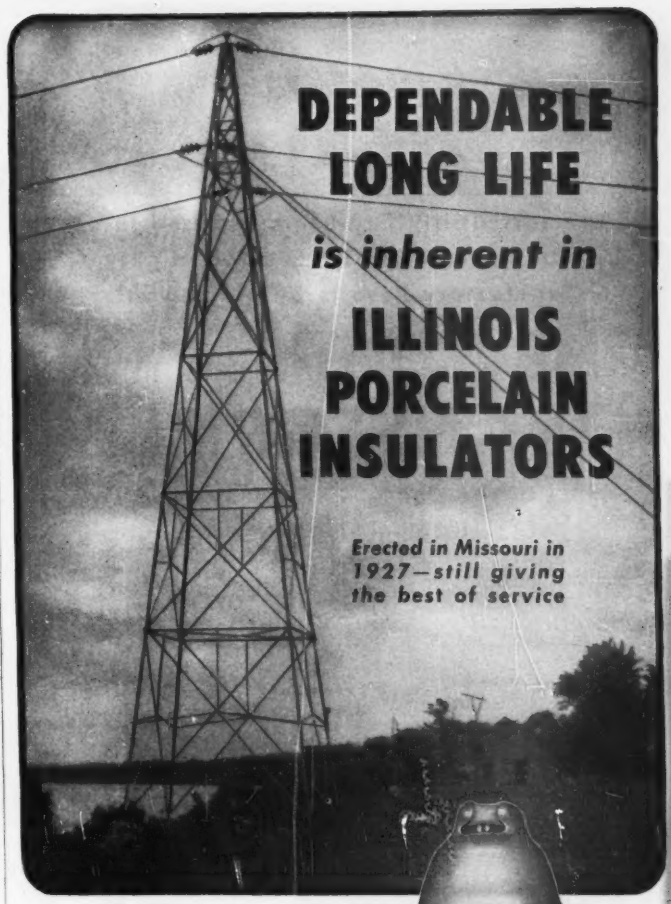
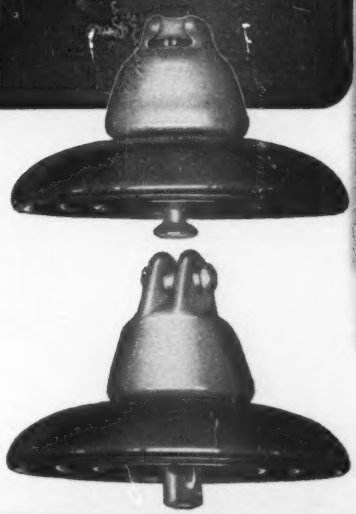


SUSPENSION TYPE INSULATORS

Produced to Illinois' exacting electrical and mechanical standards—completely tested and inspected to insure against breakdown on the job. This, plus a proved record in countless installations like the one pictured above give complete assurance of long years of thoroughly dependable service.

PIN TYPE INSULATORS

Low voltage, high voltage—one piece or multi-part—a complete line of pin type insulators, tested and proved, for every distribution job.



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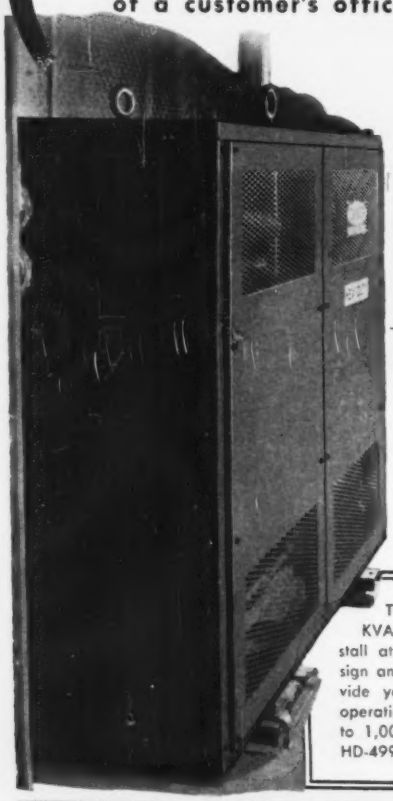
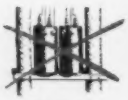
They Saved Time and Money, too!

Smart Utility Engineers Reduced Installation Costs and Secured Highly Satisfactory Results by placing this

HEVI DUTY DRY TYPE TRANSFORMER

in the unused storage space of a customer's office building





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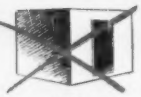


NO EXPENSIVE VAULTS

This Hevi Duty 31FH, 225 KVA transformer, is easy to install at load centers. Liberal design and rugged construction provide years of quiet dependable operation. Other sizes from 1/4 to 1,000 KVA. Write for bulletin HD-499.

HEVI DUTY ELECTRIC COMPANY

HEAT TREATING FURNACES HEVI-DUTY ELECTRIC EXCLUSIVELY

DRY TYPE TRANSFORMERS — CONSTANT CURRENT REGULATORS

MILWAUKEE 1, WISCONSIN

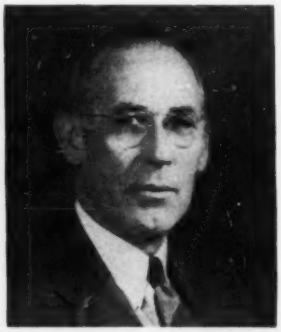
neer at the Schenectady Works. In 1926 he was transferred to Nela Park, Cleveland, where he set up the company's Product Service Division. Three years later he became manager of the division. In 1945 Noll was made head of the technical and education section.

•

Hill Elected Treasurer of N. E. Power Service Co

Harry R. Hill, assistant to the chairman of the board of the New England Electric System, has been named treasurer of New England Power Service Co.

Joining Power Construction Co in 1923, Hill soon afterwards became



H. R. HILL

engaged in accounting and retail auditing for New England Power Engineering & Service Corp. In 1928 he transferred to the former New England Power Association.

Hill was made assistant to the treasurer of New England Power Service in 1940 and later assistant to the president. The following year he became assistant to the chairman of the board.

•

Thomas J. Hanley, service and erection engineer for Allis-Chalmers Manufacturing Co for the last nine years, has been named supervisor of electrical and hydraulic turbine service and erection. He joined the company in 1940.

E. E. Kline, manager of the electric distribution department of Cincinnati Gas & Electric Co, has retired after 47 years of service. Starting with the company in 1904 as an electric meter apprentice, Kline became assistant superintendent of the electric meter department in 1923 and superintendent in 1931. He was promoted to the

Chemical Brush Control

by the mile!

ESTERON *BRUSH KILLER*

Today, miles of right-of-way are being cleared with Esteron Brush Killer. This widely used Dow formulation now contains more powerful type esters of 2,4-D and 2,4,5-T—effective against a wider variety of brush and weeds and much less volatile than materials previously available. It controls alder, ash, birch, brambles, cherry, elm, hickory, maple, oaks, osage orange, poison ivy, sumac, willow and other hard-to-kill species—also prevents resprouting of stubs and stumps.

Dow has approached brush control problems *from your side.* We are in a position to offer valuable assistance to help you decrease clearing costs—simplify maintenance—and increase efficiency of airplane patrol of power lines. We will gladly furnish you with a list of responsible service organizations engaged in the application of chemicals for right-of-way vegetation control. Write for Booklet IN-168.

Also recommended for woody plant control is Esteron 245. Where brush is not a problem—2-4 Dow Weed Killer, Formula 40 controls a long list of annual and perennial weeds. For controlling Johnson, quack, Bermuda and other perennial and annual grasses—also palmetto—use Dow Sodium TCA 90%. No fire hazard—and grazing cattle will not be poisoned.

Agricultural Chemical Division

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

USE DEPENDABLE DOW AGRICULTURAL CHEMICAL PRODUCTS

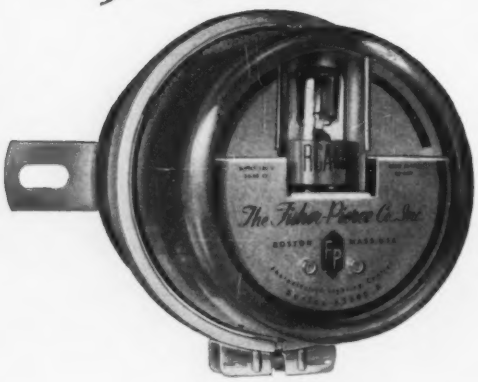
WEED, BRUSH AND GRASS KILLERS • INSECTICIDES
FUNGICIDES • PLANT GROWTH REGULATORS
GRAIN AND SOIL FUMIGANTS • WOOD PRESERVATIVE

DOW

CHEMICALS

INDISPENSABLE TO INDUSTRY AND AGRICULTURE

Improved....



Series 63300 B

FISHER-PIERCE

PHOTOELECTRIC CONTROL

FOR STREET LIGHTING

This new Fisher-Pierce Control is the result of long experience in design and manufacture, combined with practical experience of more than 600 electric utilities in more than 20,000 installations.

The new 63300 B Control is mechanically and electrically interchangeable with existing controls. The same dependable Fisher-Pierce circuit, consistently giving tube life of more than 20,000 hours, has been retained. Improved spacing and insulation provides increased protection against lightning damage . . . up to 2500 volts rms Hipot. Mechanical design has been altered to provide maximum simplicity for greater economy of servicing.

The FISHER-PIERCE Co., Inc.

82 CEYLON STREET, BOSTON 21, MASS.

position of superintendent of the electric distribution department in 1944 and four years later was made manager of the department.

•

J. F. Porter, Jr, Resigns from Kansas P&L Co

Joseph F. Porter, Jr, son of the organizer of the present Kansas City Power & Light Co, has resigned his post of vice president in charge of

J. F. PORTER, Jr

sales with the company to devote his time to other interests. He has held this position since 1936.

Since the death of J. F. Porter, Sr, in 1942, the younger Porter has become interested in mining, manufacturing, and new product developments outside the company. Therefore, he said he did not believe it fair to the company for him to divide his time between the utility and personal business.

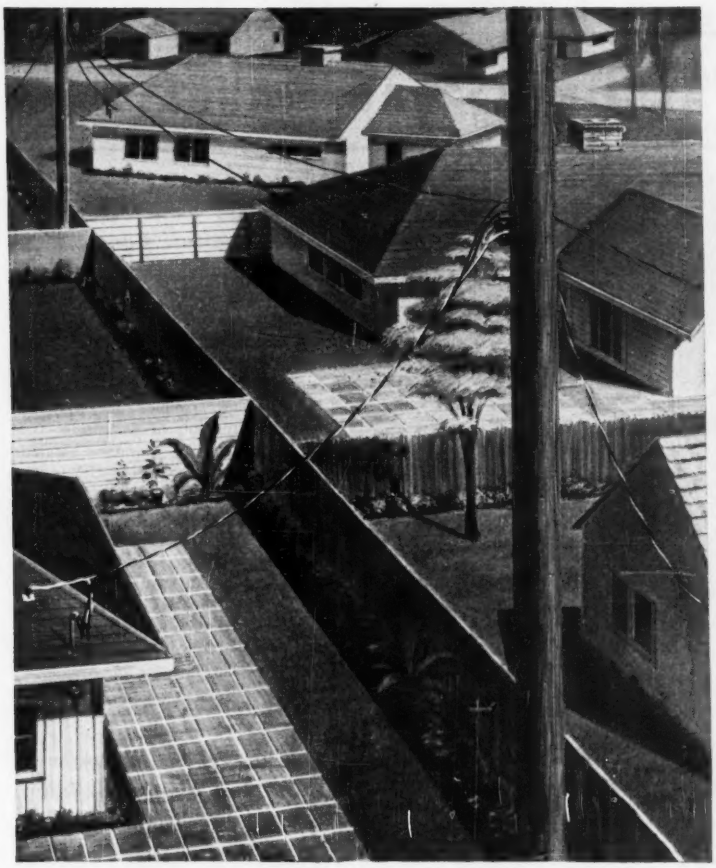
Porter, who has been an employee of Kansas City P&L for 30 years and an officer for 15, will leave his executive position July 1. He will remain on the board of directors.

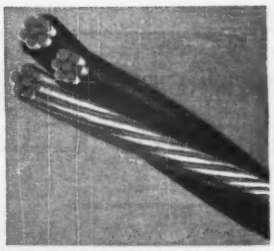
•

Overton Giles has been named manager of the Blue Grass Rural Electric Cooperative Corporation, Nicholasville, Ky. Giles, assistant manager of the Owen County Rural Electric Cooperative, replaces **Richard Forrest.**

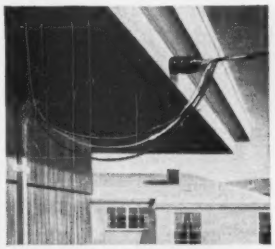
OBITUARY

F. H. Doremus, 50, Rocky Mountain district manager of General Electric Co, Denver, died June 2 at his home in Denver on the eve of the Edison Electric Institute Convention there.





THREE-IN-ONE—Triplex is a single cable made up of three wires—two neoprene or polyethylene covered wires cabled about the bare neutral messenger. Light in weight, free-stripping, clean to handle.



FEWER ACCESSORIES! Triplex cable requires only one house knob instead of three. It reduces cluttered appearance on houses and community pole lines.

ANOTHER COST-SAVER—Kaiser Aluminum Weatherproof Conductor—neoprene or polyethylene covered—cuts costs 30 to 40 per cent. Resists moisture, abrasion, fungi. Clean stripping, and eliminates festooning.

TECHNICAL ASSISTANCE—Service engineers with years of experience in the conductor field will gladly provide technical assistance. Call any Kaiser Aluminum office. See your Classified Directory.

New triplex service drop cuts costs 20 to 40 per cent!

COMPARE the advantages of Kaiser Aluminum triplex service drop cable over conventional open wire construction . . . and you'll see *why* it cuts costs . . .

Triplex needs fewer accessories. Light weight and low wind and ice loadings reduce tension on house and pole, permitting longer spans, cutting maintenance. Installations are faster, easier.

Result: *Savings of 20 to 40 per cent! Plus* increased clearances, fewer contacts with trees, thanks to the single cable. *Plus* a far neater appearance.

FREE BOOKLET gives complete engineering data on new Kaiser Aluminum covered conductor—both weatherproof and self-supporting. Send for it today! Sales offices in principal cities. Plant office: Newark, Ohio. Kaiser Aluminum & Chemical Sales, Inc., Oakland, California.

Kaiser Aluminum

Setting the pace . . . through quality and service

MANUFACTURERS and MARKETS

AWARD OF MERIT in national building products literature competition is presented to Harry L. Harrison, right, advertising manager of Miller Co, Meriden, Conn., for current series of catalogs put out by his company. Making presentation is R. J. Canavan, technical director of the Producers' Council, Inc

TV Awards Will Be Made by Sylvania Electric Co

Sylvania Electric Products, Inc, will present a series of awards in the fall for the greatest contributions to creative television technique.

The chief award will be made for the outstanding program during the period from Jan. 1, 1951, to Aug. 31, 1951. Other citations will be given to a writer, producer, director, actor, actress, master of ceremonies, camera man, scene designer, choreographer, dancer, lighting expert, and make-up man for the greatest individual contributions in the television field.

Deems Taylor heads the committee of judges.

•

Westinghouse Electric to Build Glass Bulb Plant

Westinghouse Electric Corp will build a glass plant near Hot Springs, Ark., to make bulbs for incandescent lamps.

Except for glass tubes for fluorescent lamps and small diameter glass tubing for incandescent lamps, the company presently buys all its light bulb blanks from glass manufacturers.

The 30-acre plant, located on the shore of Lake Catherine, will serve as a feeder for the company's lamp manufacturing plant in Little Rock, Ark. It will employ 500 and contain 300,000 sq ft of floor space.

•

6 Affiliated Companies to Be GE Departments

General Electric Co will make six of its manufacturing affiliates departments of the parent company on June 30.

The affiliates are Carboloy Co, Inc, Detroit; General Electric X-Ray Corp, Milwaukee; Locke, Inc, Baltimore; Telechron, Inc, Ashland, Mass.; Monowatt, Inc, Providence, R. I.; and the Trumbull Electric Manufacturing Co, Plainville, Conn.

As departments of GE, they will continue to operate under their present management and their products will be marketed under existing trade names.

Miller Co Wins Award in Literature Competition

The Miller Co, Meriden, Conn., manufacturers of lighting equipment, has been presented an award of merit for its current series of catalogs in the national building products literature competition sponsored jointly by the Producers' Council, Inc, and the American Institute of Architects.

The awards for literature entered in the competition by manufacturers in the construction industry were made on the basis of design, planning, information, and helpfulness to architects and builders.

Miller won an award in the 1949 contest for a lighting booklet it published. Presentation of the awards was made at the annual meeting of the American Institute of Architects held recently in Chicago.

•

Graybar Electric Opens New District Building

Graybar Electric Co has opened new Eastern district headquarters in a three-story, block-square building in Long Island City, New York. Formerly at 180 Varick St in Manhattan, the headquarters are now located at Bridge Plaza North and 21 St, Long Island City.

The move was made to meet the growing demands of New York, Westchester, and Long Island industries for electrical products of all kinds.

Total floor space in the new building is 105,000 sq ft. The building contains offices, loading platforms, warehouse space, an appliance display room, and a small auditorium.

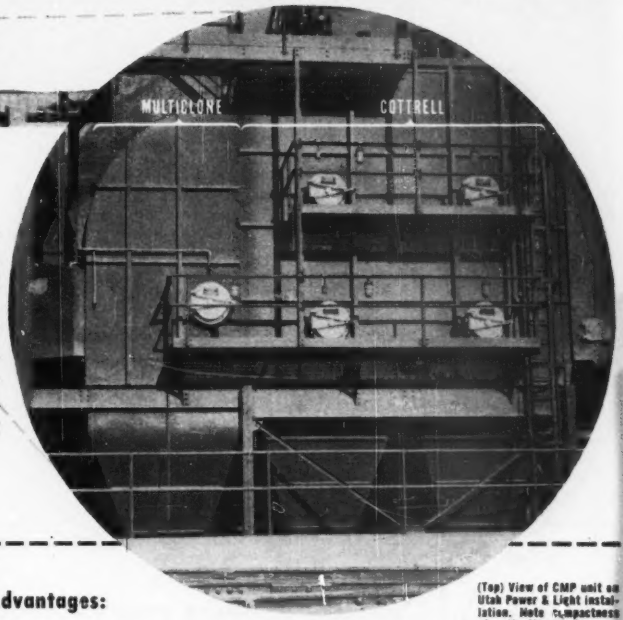
•

Canadian Westinghouse Forms Supply Company

Canadian Westinghouse Co has announced the formation of a wholly owned subsidiary, Canadian Westinghouse Supply Co, to distribute its products.

The new company will establish

Consider these important advantages of a WESTERN PRECIPITATION CMP UNIT!



IF YOU are planning the installation of any type of fly ash recovery equipment—mechanical or electrical—it will pay you to investigate the extra advantages to be gained by installing a CMP Unit designed, engineered and constructed under *one* responsibility by Western Precipitation Corporation—*leaders in both electrical and mechanical recovery fields!*

(Top) View of CMP unit on Utah Power & Light installation. Note compactness of unit. (Above) Close-up of cone installation.

Combines Mechanical and Electrical Advantages:

A CMP (Combination Multiclone-Cottrell Precipitator) Unit combines—in one compact installation—both mechanical and electrical recovery principles, so that maximum benefit is obtained from the advantages inherent in each method. The MULTICLONE section centrifugally cleans the gases of the larger and heavier fly ash particles (down to a few microns in diameter) . . . and the COTTRELL Precipitator then electrically removes the very small particles remaining in the gases. This combination arrangement has important advantages:

1. Using the MULTICLONE for cleaning out the heavier particles permits the bulk of the recovery operation to be performed with relatively low-cost equipment.

2. Using the COTTRELL for final clean-up insures unusually high recovery efficiency—approaching theoretically perfect, if desired—with a high efficiency, compact Precipitator unit.

3. Each type of unit—MULTICLONE and COTTRELL—can be arranged for its most efficient application. MULTICLONES may be connected to each separate boiler, if desired, and their draft requirement cut out when the boiler is down . . . while a central COTTRELL handles all gases and operates at higher efficiencies, with continued low power cost, when one or more boilers are down.

4. During soot-blowing periods, or while warming up cold boilers, the MULTICLONE efficiency usually increases, preventing overloads of detrimental carbon from reaching the COTTRELL.

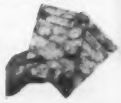
Only Western Precipitation Combines Multiclone and Cottrell "Know-How"—In ONE Organization!

A vital factor in obtaining maximum efficiency and economy in CMP installations is the proper balance of mechanical and electrical recovery equipment to the individual requirements of *each* application. Western Precipitation is unique in that it not only pioneered the commercial application of COTTRELL Electrical Precipitators over 43 years ago, but also has been a leader for many years in the *mechanical* recovery field with its widely-recognized MULTICLONE Collectors.

Result—Western Precipitation has the all-important "know-how" and experience in BOTH fields . . . knows from first-hand experience how to fit the *right* equipment in the *right* place, to do *your particular* job . . . and can provide the complete installation under ONE responsibility and ONE overall guarantee!

Let Our Experienced Engineers study your recovery requirements and make recommendations on the equipment best suited to your operations. A wire, phone call or letter to our nearest office places this unique "Know-How" at your service, without obligation!

Send for descriptive literature!



WESTERN Precipitation CORPORATION

ENGINEERS, DESIGNERS & MANUFACTURERS OF EQUIPMENT FOR COLLECTION OF SUSPENDED MATERIALS FROM GASES & LIQUIDS

Main Offices: 1004 WEST NINTH STREET, LOS ANGELES 15, CALIFORNIA
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PRECIPITATION CO. OF CANADA, LTD., DOMINION SQ. BLDG., MONTREAL

"Weren't we lucky, Betty,
that we picked a **KOPPERS POLE?**
Look how it's lasted!"

● It probably was a matter of luck that Dad chose a Koppers Pole for his sentimental carving . . . but it is strictly a matter of good business when Purchasing Agents and Line Supervisors choose Koppers Full-Length Pressure-Creosoted Poles.

They are interested in long pole life to reduce maintenance work and cut replacement costs. They want poles that retain their strength and provide long periods of uninterrupted service. And they agree on . . . Koppers Poles.

Koppers is the kind of company you like to deal with, too. Deliveries are dependable. The high quality of the poles is constant. All transactions are on a businesslike basis. These factors definitely make your line operation easier and more economical.

KOPPERS COMPANY, INC. PITTSBURGH 19, PA.

KOPPERS PRESSURE-TREATED WOOD

facilities in principal trading centers throughout Canada to enable customers to buy complete lines of electrical equipment and home appliances. The supply company will also sell under contract other lines such as cable, conduit, and fittings not manufactured by Canadian Westinghouse.

Roy L. Brown, formerly eastern district manager of Westinghouse Electric Supply Co in New York, will be president of the new firm.

•

Large Electric Plant Being Built by Reynolds

Reynolds Metal Co is installing 78 internal combustion engines with a total of 256,300 hp and driving dc generators with a capacity of 176,000 kw to supply power for its new aluminum reduction plant in Corpus Christi, Tex.

The plant, using natural gas for fuel, will be the largest gas-burning engine plant ever built. It will consume a million cu ft of natural gas an hour. Capacity of the plant is 150 million lbs of aluminum a year.

MANUFACTURING BRIEFS

Hotpoint, Inc, has leased 50,000 sq ft of warehouse space near its Chicago Heights manufacturing facilities. The additional warehouse space will enable the company to expand its production of commercial electric cooking equipment in order to meet orders related to the increased need of industry for mass-feeding facilities.

Westinghouse Electric Corp's transformer division has received an order from Detroit Edison Co for four 190,000-kva transformers for installation in the utility's St. Clair Station. The 3-phase, 60-cycle transformers are the largest ever built and are rated 15-kv on the low-voltage side and 138-kv on the high-voltage winding.

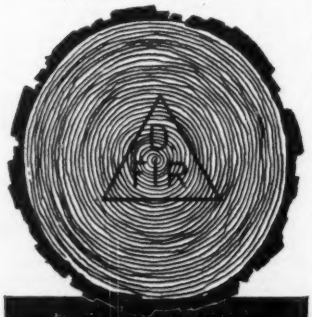
Metal Prices
June 11, 1951

COPPER, Conn. V., lb	$ .24½
LEAD, N. Y., lb	.17
ZINC, prime Western, E. St. Louis, lb	.17½
TIN, Straits, qual. N. Y., lb	1.29
ALUMINUM, ingot, base price	.19
NICKEL, base price	.56½
STEEL billets, Pitts., ton	56.00
STEEL, scrap, No. 1 heavy, Pitts., ton	45.00

FOR LONG LIFE and low service cost, the big 3 in western poles are Western Larch — Lodgepole Pine — Douglas Fir.

All 3 are grown on the virgin forest lands of the J. Neils Lumber Company in western Montana. All 3 are produced and treated in J. Neils modern pole plant at Libby, Montana.

J. Neils Lumber Company, since 1895 a quality manufacturer of forest products, invites your inquiry on transmission and telephone poles. An illustrated folder on J. Neils treated poles, and information regarding their application to your own requirements, will be furnished on request.



POLE DIVISION
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Libby, Montana

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BETTER PROTECTION

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This 21½" x 15" x 14" Carton Packs Ten Eight Foot Guards

Approved by R.E.A.

Aluminum-coated hardwood Flexibal Guards are made up in six-inch units, packed in 5, 6, 7 and 8' sets, complete with galvanized clamp and nails set. Just slip over the wire and drive the nail home. No waiting; no storage problem; no handling troubles; no cripples to replace. Specify Flexibal — the flexible non-damaging guy guard — now!

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Delta-Star cast-to-size square tube connectors feature "point-to-point" high pressure embedation at each corner, providing hundreds of contact points with the copper bus. To insure this high pressure contact for the life of the installation, Delta-Star equips all nuts and bolts with PALNUT Lock Nuts, which prevent loosening in service. Delta-Star, for years, has used dependable PALNUT Lock Nuts wherever tight assemblies are vital.

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TRADEMARK

Absolute Security

for every nut and bolt assembly

—at very low cost!

The simple application of a PALNUT Lock Nut on top of an ordinary nut, ends all danger of loose bolts, connections and assemblies. PALNUT Lock Nuts exert a powerful double-locking spring action on bolt and nut that defies loosening under vibration, stress or weather.

PALNUT Lock Nuts are very low in cost, apply fast, require only 3 bolt threads space, may be removed and reused. Full range of sizes, in plain, Hot Dipped Galvanized and other materials or finishes used by the Utility industry.

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NEW ELECTRICAL CONSTRUCTION

NEW ELECTRICAL construction projects announced by private and government utility systems involving more than $70,000. Also listed are major industrial and construction jobs where electrical work is included

UTILITIES

Proposed Construction

Arizona—Bureau Reclamation, Dpt. Interior, Phoenix, transformers, circuit breaker, disconnecting, switches for Tucson sub-station, Davis Dam Proj., Spec. 300S-25. L. N. McClellan, Bldg. 1-A, Denver Federal Center, Denver, Colo., ch. engr.

Arkansas — Arkansas Valley Electric Co-operative, Ozark, Ark., Project ARK 13,490 miles rural distr. lines and other systems imprvs. **$1,040,000.** H. B. Gleb & Assoc., Ozark, consult. engrs.

California—Bureau Reclamation, Dpt. Interior Bldg. 1-A, Denver Federal Center, Denver, Colo., furnishing, del. f.o.b. cars shipping plant Herdlyn and Bethany, control board extension, circuit breakers circuits, for Tracy Switchyard, Central Valley Proj., Spec. DS-3447. L. N. McClellan, ch. engr.

Colorado—Bureau Reclamation, Dpt. Interior, Bldg. 1-A, Denver Federal Center, Denver, 3 air compressors, 2 air compressor outfits, 3 after coolers, 3 air receivers for Pole Hill power plant and Flatiron power and pumping plant, Colorado Big Thompson Proj., Spec. 704S-191. L. N. McClellan, ch. engr.

Mich., Flint—State, A. N. Langlus, dir. State Bldg. Dpt., Lansing, plans by O'Dell, Hewlett & Luckenbach, 2300 Dime Bldg., Detroit, 1 story, brick, concrete power plant, Michigan School for the Deaf. **$500,000.**

Minn., Marshall—City, Water, Light, Power & Bldg. Comn., D. B. Taylor, pres., H. N. Harmon, secy., piping, auxiliary equip., elec. equip., station wiring, alterations at municipal power plant, $82,000. Plans deposit $35, Pfeifer & Shultz, 702 Wesley Temple Bldg., Minneapolis, engrs.

Montana — Bureau Reclamation, Bldg. 1A, Denver Federal Center, Denver, Colo., furnishing, del. f.o.b. cars shipping point or f.o.b. cars Coram, one line relaying board, designation CCC, laboratory test panel, designation NSO and NSE, Hungry Horse Power Plant, Hungry Horse Proj., Spec. DS 3449. L. N. McClellan, ch. engr.

Nev., Las Vegas—U. S. Atomic Energy Comn., 400 Stewart St., 10 mi. power line and 10 mi. signal line at Alternate Test Station. $250,000. Plans deposit $50.

N. J., Dover—U. S. Eng., 80 Lafayette St., New York, 13, N. Y., cost propellant power plant and bldg., etc. at Picatinny Arsenal.

North Dakota—Bureau Reclamation, Dpt. Interior, Bldg. 1-A, Denver Federal Center, Denver, Colo., one 75-kva transformer; four 115,000 volt circuit breakers; thirteen 115,000 volt disconnecting switches; one 15,000 volt disconnecting fuse and three potential transformers for Dawson and Williston substations, Spec. DS-3440, Fort Peck Proj.

O., Columbus — Westinghouse Electric Corp., J. H. Ashbaugh, vice pres. Electric Appliance Div., Mansfield, plans by Ebasco Services, Inc., 2 Rector St., New York, N. Y., 1,900,000 sq. ft., brick jet engine components factory, W. Broad St., U. S. 403, facing Phillipi Rd., 1 mi. west of here. **$20,000,000.**

O., Dayton—Master Electric Co., 126 Davis St., 4 story, 90,000 sq. ft. factory addn. and 2 story separate factory bldg. **$1,500,000.**

Oregon—U. S. Eng., 628 Pittock Block, Portland, constr. Big Cliff gravity dam and powerhouse, complete Detroit Dam both North Santiam River. **$50,000,000.**

South Dakota—U. S. Eng., 1709 Jackson St., Omaha, Neb., powerhouse for Fort

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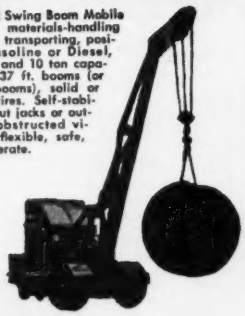

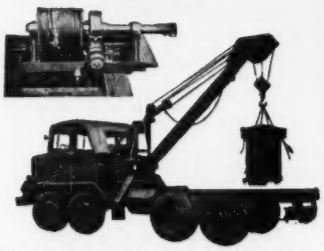

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R&S enclosure units meet all standards, plus. Major advantages include wall sections permitting a wide variety of conduit arrangement and ample wiring space. Removable covers for front accessibility facilitate close grouping and easy maintenance of control and power units.

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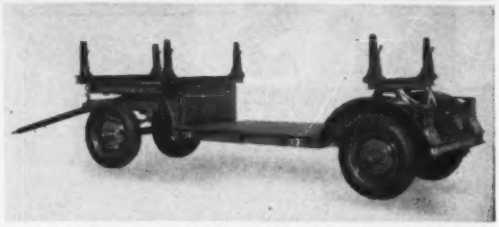

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5 tons capacity; over-all length, including tongue, 25 ft. 8 inches. Distance ground to low platform only 25-1/2 inches. Weight 5400 lbs. Equipped with electric brakes on rear wheels. Send for complete information on Model 6441—Eagle LO-BED Trailer.

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Randall Reservoir project, near Lake Andes, Inv. 102.

South Dakota — Bureau Reclamation, Dpt. Interior, Bldg. 1-A, Denver Federal Center, Denver, Colo., construct Huron, Mount Vernon, Sioux Falls and Watertown sub-stations, Transmission Div., Div., Missouri River Basin Proj., Spec. No. DC-3454.

Tex., Waco—U. S. Eng., 1127 T & P Bldg., Fort Worth, Tex., supersonic trainer bldg. and maintenance docks, at Connally Air Force Base. **$4,000,000-$5,000,000.**

Tex., Wichita Falls—U. S. Eng., Box 61, Tulsa, 2, Okla., electric power facilities. **$150,000.**

Va., Portsmouth — Pub. Wks. Office, Headquarters, Fifth Naval Dist., U. S. Naval Base, Norfolk, Zone 11, rehabilitation and replacement electrical services at Norfolk Naval Shipyard, NOY 24267, Spec. 26565. Plans deposit $40.

Wash., Moses Lake—U. S. Eng., Bldg. 602, City-County Airport, Walla Walla navigational aid bldgs., concrete encased duct lines, primary distr. line and extens. and addns. to existing lines, constr. concrete vaults, manholes and pull boxes, installing Government furnished runway, overrun lighting, furnishing, installing distr. transformers and installing Government-furnished gasoline storage tanks and appurtenances at Larson Air Force Base, near here, Serial No. CIVENG 45-165-51-10.

Wash., Wenatchee—Chelan Co. Public Utility Dist., c/o Stone & Webster Eng. Corp., 707 Lloyd Bldg., Seattle 1, Wash., structural work required in completion of Rock Island Dam and Powerhouse.

Wyoming — Rural Electric Co., Pine Bluffs, 100 mi. rural distr. lines, 18 mi. tie lines and completing previously approved construction, Laramie Co. **$320,000.** Flora Eng. Co., 1717 E. Colfax Ave., Denver, Colo., consult. engr.

Low Bidders & Contracts Awarded

Colo., Colorado Springs—Westinghouse Electric Corp., Gas and Electric Bldg., Denver, Colo., Low Bidder, **$174,796,** Items 1, 2, 6 and 7, Allis-Chalmers Mfg. Co., 1920 Market St., Denver, Colo., **$171,562,** Items 4 and 5, municipal electric plant, equip., incl. 4 power transformers, 4 low voltage switchgear units, 7 outdoor power circuit breakers, 84 disconnecting switches, City, City Hall, Colorado Springs, Colo. Bids Jan. 4.

Conn., Wallingford—W. J. Megin, Inc., 51 Elm St., Naugatuck, Conn. Low Bidder, **$841,108,** Contr. 12, power plant structures. Boro of Wallingford Electric Wks., Washington St., Wallingford, Conn. Bids May 22.

N. J., Greenwich—Atlantic City Electric Co., Kentucky and Pacific Aves., Atlantic City, N. J. Separate contracts, $6,500,000 generator plant. Burns & Roe, 233 Broadway, New York, N. Y., engrs.

Wis., Superior—Roland V. Buck, Inc., 1225 Tower Ave., Superior, Wis. Contract Awarded. Total est. **$3,100,000** incl. equip. general contract electric plant adn. Superior Water, Light & Power Co., Superior, Wis.

INDUSTRIAL, COMMERCIAL & PUBLIC BUILDINGS

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N. Y., New York—Webb & Knapp, 383 Madison Ave., Zone 17, 44 story office bldg. on site of Marguery Hotel, on block bounded by Park Ave., 47 St., Madison Ave. and 48 St. **$45,000,000.**

Low Bidders & Contracts Awarded

La., New Orleans— Haase Constr. Co., Inc., 822 Perdido St., New Orleans, La. Contract Awarded, **$14,000,000.** 16 story office bldg. as divisional headquarters. The Texas Co., 135 E. 42 St., New York, N. Y. Claude E. Hooton, 2502 Robinhood St., Houston, Tex., archts.

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UPT type

A pipe to cable tee connector. With U-bolt variable clamping feature. Accommodates a wide range of conductors.

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A rugged U-bolt type T connector having a wide variability in both the run and tap sections.

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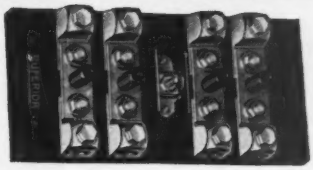

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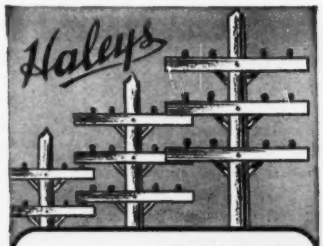

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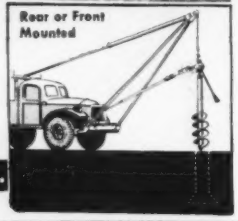

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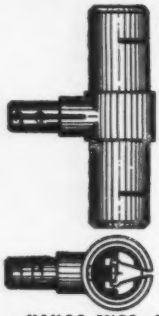

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TECHNICAL LITERATURE

Ultrasonic Testing—The ten papers and discussions included in the *Symposium on Ultrasonic Testing* represent a summary of the history, theoretical aspects, basic principles, and practical applications for the testing of materials. Copies may be obtained for $2.00 from American Society for Testing Materials, 1916 Race St, Philadelphia 3, Pa.

Magnesium Alloys—*A Determination of the Acceptability of Magnesium Alloys as Enclosures for Portable Electrical Appliances* evaluates the fire hazard involved in the use of magnesium alloys. Copies of this publication may be obtained by addressing Underwriters' Laboratories Inc, 207 E. Ohio St, Chicago 11, Ill.

Electric Fans—A revised edition of the *NEMA Standards for Electric Fans*, Publication FMI-1951 has just been published. Standards for rating, manufacturing, and performance are given. A section dealing with testing includes information on tests and calculations for air delivery ratings of both free-air and ventilating fans. Copies are available for $3.00 from National Electrical Manufacturers Association, 155 East 44 St, New York 17, N. Y.

Rubber—*Evaluation of Experimental Polymers Produced by the Office of Rubber Reserve* describes test procedures and effect of varying polymerization conditions on the properties of experimental synthetic rubber polymers. This publication sells for $2.00 in microfilm, $3.75 in photostat. Orders should be addressed to the Library of Congress, Photo-Duplication Service, Washington 25, D. C.

Electrical Code—In accordance with its usual procedure, NEMA has published an analysis of the changes made in the 1951 revision of the *National Electrical Code* published by the National Board of Fire Underwriters. Copies of the analysis are available for 25¢ from National Electrical Manufacturers Association, 155 East 44 St, New York 17, N. Y.

Home Planning—*Electrical Planning for the Modern Home* (B-4760) offers planning ideas for kitchen, laundry, lighting, heating, and wiring. "Plan, Equip, Promote, and Sell" is the theme of this guide for home builders and contractors. Write to Westinghouse Electric Corp, P. O. Box 2099, Pittsburgh 30, Pa.

Electrical Connector—Details of a double-contact automatically self-sealing electrical connector are now available in a report just released by the U. S. Department of Commerce. *Double-Contact Self Sealing Connector* PB 101 756 includes a complete description and engineering drawings for connector parts and production tools ($3.50 in microfilm, $10 in photostat). Orders should be addressed to the Library of Congress Photoduplication Service, Washington 25, D. C., accompanied by check or money order payable to the Librarian of Congress.

Corrosion—Continuing the service of periodically publishing abstracts of corrosion literature in book form, NACE is offering a volume containing abstracts of material published during 1946 and 1947. Orders are being taken by the National Association of Corrosion Engineers, 919 Milam Bldg, Houston 2, Texas at $7.00 to members and $9.00 to others.

Copper—*Standards on Copper and Copper Alloys* brings together 108 ASTM Standards. These standards represent the most up-to-date thoughts and practices and are recommended for industry usage. Copies of this 542-page book can be obtained for $4.35 from the American Society for Testing Materials, 1916 Race St, Philadelphia 3, Pa.

BOOK REVIEWS

Dielectrics

Dielectric Breakdown of Solids. **By S. Whitehead. Published by Oxford University Press, New York 11, N. Y. 271 pages, illustrated. Price $5.00.**

This is one of a group of monographs on the physics and chemistry of materials. The author is director of research for the (British) Electrical Research Association. He cites European literature on the issue and proceeds to point out the divergences, at the same time attempting to reconcile the differences. In this process there is attention to the electronics of breakdown, thermal stimulus, polarization, effect of thickness, phenomena of partial breakdown, etc. At one point, there is speculation as to whether there may not be an ideal layer-thickness. Considerable attention is accorded to the detection of internal discharges. No summary, however, is supplied to assist the reader in arriving at a realization of the paucity of sure dielectric knowledge or an insight into the author's own preferred hypotheses.

Electroplating

Electroplating. **By J. B. Mohler and H. J. Sedusky. Published by Chemical Publishing Co, Inc, Brooklyn 2, N. Y., 257 pages, illustrated. Price $5.00.**

Addressed to metallurgists, engineers, and chemists rather than electro-chemists or professional electroplaters, the book therefore minimizes theoretical content for the sake of focussing on practices and practicalities. At the outset there is guidance for preparation of the tank and bath with discussion of the characteristics of commercial baths for the customary metals. After treating alloy plating and certain special objectives, the subject matter passes to bath troubles. Here is where the specifically recommended formulas are entered and with them the measures to avoid unsatisfactory results. Appendices deal with pickling and cleaning solutions and additional bath formulations.

Transformers

Transformers: Their Principles and Design for Light Electrical Engineers. **By F. C. Connelly. Published by Pitman Publishing Corp., New York. 490 pages, illustrated. Price 35s net.**

With brief attention to high voltage transformer, the book devotes the first two-fifths to basic design principles, temperature rise, leakage, and transients thence applies this foundation to 3-phase designs, rectifier types, auto-transformers, instrument transformers. Thereafter the treatment verges to transformers for electronics, radio, and television. There is a strong thread of unity throughout.

Professional Engineering

Engineering and Western Civilization. **By J. K. Finch. Published by McGraw-Hill Book Co, Inc, New York 18. 397 pages, illustrated. Price $5.**

Engineering has been growing for 50 centuries and most rapidly in the 19th and 20th. Professor Finch narrates the milestone contributions with due recognition to mechanical and electrical as they entered the arena alongside the earlier civil engineering. Along the route there are intimations of the disruptive consequences to the economy and the sociology of the transformed civilizations. Statistics support one conclusion that the benefits of our productive system must be widely diffused and accelerated. In short the engineer must strain to keep the demand in parity with the created productive capability. Research, he points out, is the means whereby both output and absorption are stimulated to maintain the indispensable equality. No escape is foreseen from increasing government intrusion by control and even usurpation of the enterprise system.

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1—	500	Whse.	900	250	440
1—	500	G.E.	720	125	2300
1—	400	G.E.	720	250	440/2300
1—	350	G.E.	900	125	4150

TRANSFORMERS—60 Cycle

	KVA	Make	Type	Ph	Voltages
2—	4000	G.E.	HT	3	22000x2300
3—	1250	G.E.	HVDDJ	1	6600x250
4—	500	G.E.	HDD	1	22850/12200x480
4—	333	G.E.	HKDD	1	13800/6900x230/460
6—	300	G.E.	HT	3	2400x240/480
8—	300	G.E.	HT	3	13800x240/480

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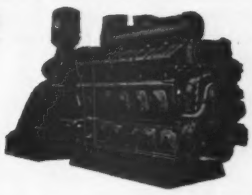
UNIT CAPACITIES—10 TO 1875 KVA
A.C.—50 AND 60 CYCLES
VARIOUS VOLTAGES



A PARTIAL LISTING OF OUR INVENTORY

KVA	Make	Model	HP	RPM	KVA	Make	Model	HP	RPM
1875	Fairbanks Morse	33F16	2000	300	375	Enterprise	DSG-6	450	480
1420	Fairbanks Morse	38D8½	1600	720	230	Superior	KNA	396	514
1250	General Motors	16-278A	1600	720	312	General Motors	8-268A	450	1200
937.5	General Motors	12-567	1080	720	212	Clark	MID-4	275	327
625	Alco	6-13½x18T	750	600	125	Ingersoll Rand	S	225	514
425	Baldwin	VO-6	510	450	187	General Motors	3-268A	150	1200
400	Buckeye	80	480	600	75	General Motors	6046C	90	1200

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1—500 KVA Kuhl, 1 Ph., 4150V to 2300V.
3—400 KVA G.E., 1 Ph., 6900V 2300V Sec.
1—200 KVA G.E., 3 Ph., 2400V 220 Sec.
1—150 KVA G.E., 3 Ph., 4150V 120/208Y.
6—50 KVA G.E., 1 Ph., 13,450V, 120/240 Sec.
6—25 KVA G.E., 1 Ph., 440/220, 220/110 Sec.

SYNCHRONOUS MOTORS

1—300 H.P. Elec. Mach. 720 RPM, 3 Phase 60 cy., 2200V. Totally Enclosed Fan Cooled Outdoor Service.

MOTOR GENERATOR SETS

1—1000 KW G.E., 600 V, 514 RPM, 4000V Syn.
1—176 KVA West., 1 Ph. 220V, Motor 3 Ph. 440V.
1—150 KW G.E., 125/250V, 1200 RPM, 2300 Syn.
1—100 KW El. Mchy. 125V, 1200 RPM 4150V Syn.
2—40 KW El. Mchy., 125V, 1200 RPM, 440 S.C.

SLIP RING MOTORS

1—2500 HP G.E., MT, 257 RPM, 6600V.
1—250 HP West., CW, 600 RPM, 440V.

SYNCHRONOUS CONDENSER

1—2500 KVA Whse., 720 RPM, 2200V with D.C. Exc.

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LETTERS TO THE EDITOR

Bend TV Around Mountain

To the Editor:

In your May 7 issue of "Electrical World" you state in your Technical Notes that television microwaves can be reflected into no-reception valleys by areas of aluminum sheet mounted high in the beam path.

Our community is located at the foot of a 3485-ft mountain. The television signal strength on channel 3 from Charlotte, North Carolina, is from 0 to 12 microvolts in the town proper and is 220 microvolts on the mountain.

Will you please advise if and how the beam can be reflected down and in a slight oblique angle in order that we may receive television.

Fred L. Carrico
111 8th Street
Pulaski, Virginia

To the Editor:

In the May 7 issue of "Electrical World" I note this item: Television microwaves can be reflected into no-reception valleys by areas of aluminum sheet mounted high in the beam path. I would appreciate knowing the source of this information.

You of course are aware of the rapidly growing number of projects for supplying television service to customers in no-reception valleys by an antenna tower on a nearby ridge or hill in the line-of-sight field and distributing by co-axial cable with frequent boosters.

Perhaps the reflection scheme foreshadows development of simpler means of supplying television service in such areas.

P. H. Chase
Philadelphia Electric Co
Philadelphia, Pa.

(Editor's Note: An article by Radio Corporation of America in the March 1950 issue of "Electronics" stated that good results have been obtained in reflecting 960 mc (microwave) signals around and over mountains using a 9x10-ft screen wire reflector. However, to reflect channel 3 waves (60 mc), it is estimated that a reflector 150 ft square would be necessary. Perhaps reader Chase's comment on co-axial distribution would be a solution to reader Carrico's problem.)

NACE Membership

To the Editor:

I am writing to tell you how much we appreciate the editorial and write-up concerning the 1951 NACE Conference, that appeared in the March 26 and April 9 issues of "Electrical World."

The last paragraph of the editorial stated that some 35 or 40 members are from combination gas-electric utilities and a few are from electric utilities. I am sure that you intended to convey the idea that these were corporate (company) members and not active (individual) members. Actually there are nearer thirty corporate members that are either electric or combination, electric-gas. The number of active (individual) members from the electric, gas, and gas-electric (combination) utilities is approximately 570. Some have taken the "35 or 40" in the last paragraph of the editorial to be the number of individual members from this group of companies.

A. B. Campbell
Executive Secretary
National Assn Corrosion Engineers
Houston, Texas

New Word for Capitalism

To the Editor:

I think your editorial in Electrical World of June 4, 1951 is very timely because of the thoroughly undesirable connotation of the word capitalism.

Although the words are by no means original with me I cast my vote for "free enterprise." Freedom, in almost any connection, is highly desirable in these days when there is so little of it under Communism. "Enterprise" is defined as a project which involves activity, courage, energy; and surely, a successful business requires all of that in these days of mounting bureaucracy.

To me "free enterprise" signifies a perpetuation of those principles that have raised the standard of living in this country to such a high plane.

D. D. Dalzell
Supervisor Advertising and Promotion Service
Transformer and Allied Products Div.
General Electric Co
Pittsfield, Mass.

Engineers Agree on Pay

To the Editor:

Your March 12, 1951 editorial on "How to Get Engineers" hits the nail on the head. Not only are electrical utility engineers underpaid, but in addition the engineers with years of service are more underpaid than the beginners. I have yet to meet an experienced engineer, other than management, who will encourage his son or any other young man to enter professional engineering. How can we sell anyone on engineering when after a college degree and 10 or 15 years of service, the salary is still below that of electricians, plumbers, carpenters, etc?

Experienced Engineer

Dayton Not Detroit

To the Editor:

In the article on "130 Shortcuts to Proved Savings" in the issue of "Electrical World," May 21, 1951, there is a picture in the upper right hand corner of page 150 which credits the idea and the photograph to the Detroit Edison Co. You will notice that the truck shown in the picture bears the emblem of the Dayton Power and Light Co.

We realize that a mistake like this is easy to make, but we thought we had better call it to your attention in case some of your readers wish to obtain more details.

Fred H. Dettmar
Public Relations
The Dayton Power & Light Co
Dayton, Ohio

(Editor's Note: Profound apologies to Dayton Power and Light Co and a free course in Braille reading to the editor who missed this one.)

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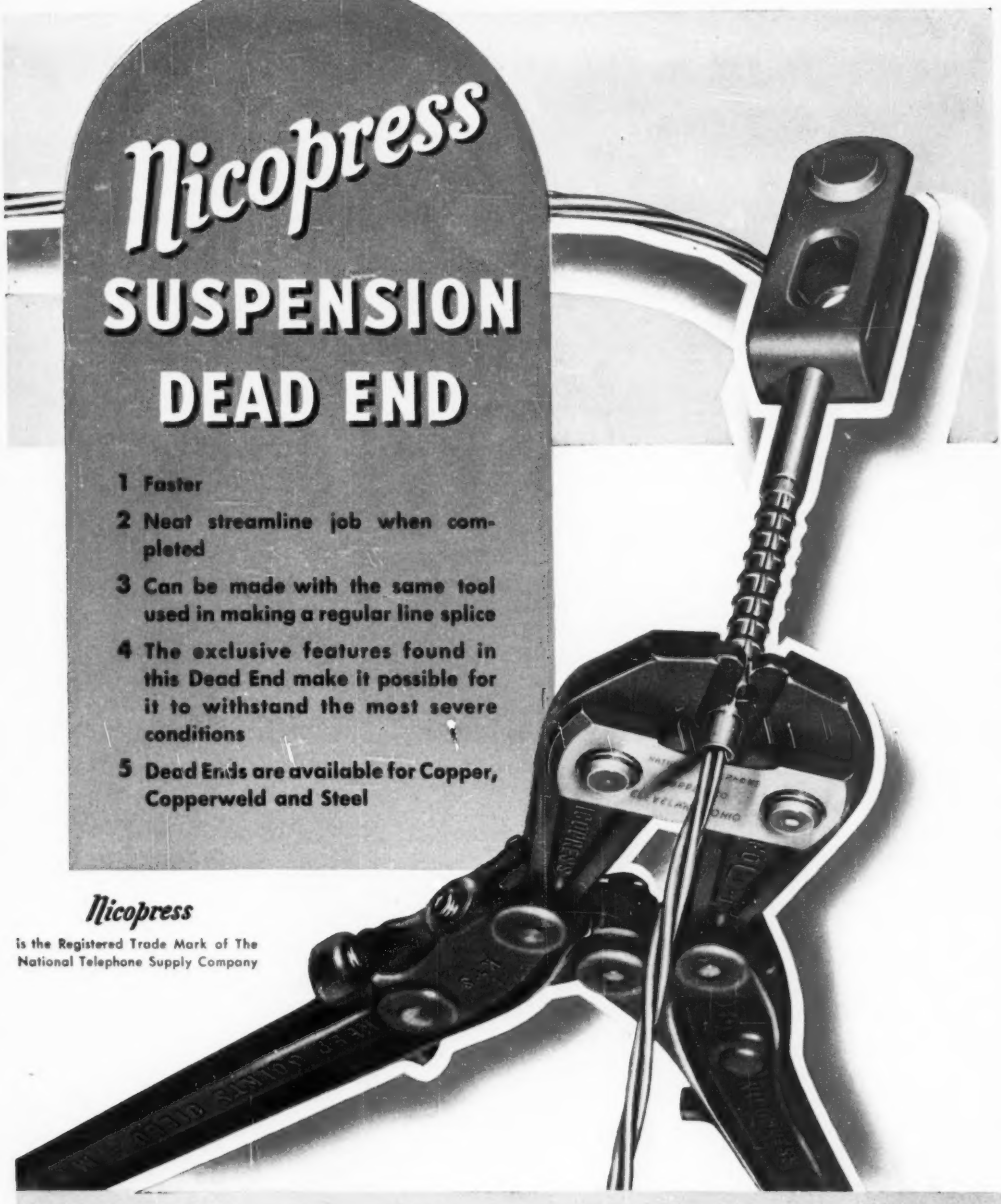

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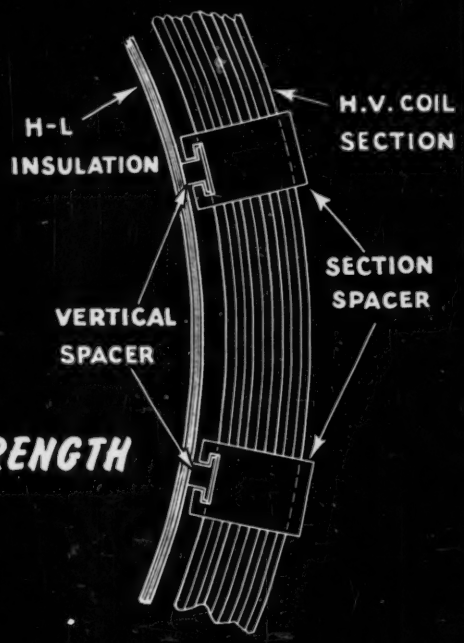

The Kuhlman lock spacer is a permanent connection between the section spacer and the high-low insulation barrier which supplies a firm, solid rigidity to the coil structure. No tape or other material of a temporary nature is used in the Kuhlman connection. Thus, there is no chance of coil sections in Kuhlman Power Transformers working loose from the expansions and contractions of operating temperatures.

A small item? Perhaps. But consider the consequences should coil sections work loose and come in contact with each other. That is a situation only costly repair time can correct. And it **can't** happen with Kuhlman Power Transformers—thanks to Kuhlman lock spacers.

It is close attention to small details like this which has kept Kuhlman among the leaders in the transformer industry for well over half a century. Keep it in mind the next time you buy power transformers. In the meantime, write for Kuhlman Bulletin CS-601, on Kuhlman power units.

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